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Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET
November 1981 No. 159

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FOREWORD

We are very pleased to announce that Jim Vaughan and Katie Bowen are opening the Nuexco East Coast office this month at 450 Avenue of the Americas, New York, New York 10011. Formal announcements will be mailed at a later date to include mailing address, telephone and telex information as well as directions.

Nuexco will host a hospitality suite during the Atomic Industrial Forum Annual Conference 1981. The suite will be at the St. Francis Hotel in San Francisco, November 29-December 2.

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URANIUM MARKET

PRICING

The **Exchange Value** remained at $23.50 per pound U_3O_8 for the fourth consecutive month.

The market was relatively active during October as five sales were made by US sellers, involving a total of about 1.8 million pounds U_3O_8. Two of the transactions were for immediate delivery and were priced somewhat below Exchange Value. Two others were for delivery in 1982 with fixed prices somewhat above Exchange Value. The last transaction was for delivery in 1983-84 with a base price below Exchange Value, but subject to index escalation to the time of delivery.

The near-term market is firming up both on the supply side and the demand side. The total of material available for sale, as indicated in the *Market Opportunities* section of the Report, is about 8.7 million pounds U_3O_8. About sixty percent of this material is being offered for sale by utilities. At least six separate utilities are active sellers in the near-term market, up from the average over the last few months.

Likewise, the demand side of the market is continuing to strengthen. The total of demand in the near-term market is about 4.3 million pounds U_3O_8, about two-thirds of which is being sought by producers. The number of projects listed on the demand side of the *Market Opportunities* section of the Nuexco Report has been growing over the past several months.

With both the supply side and the demand side of the near-term market growing, one might look forward to a relatively brisk market over the next several months. The market may be characterized as being in *unstable equilibrium*. With so many inventory holders actively trying to sell, it is possible that several will become aggressive simultaneously and combine to drive prices down. At the same time, decisions by several producers to lock up near-term supply, as an alternative to producing material themselves to deliver under supply contracts, could firm up prices. Active market participants should watch the market carefully, because prices could move suddenly.

The **Transaction Value** increased slightly to $24.10 per pound U_3O_8 from $23.90 the previous month. The increase was largely on the strength of the two fixed price contracts for 1982 delivery which closed this month. The **Loan Use Charge Rate** increased to six percent this month as potential lenders generally increased the rates being sought.

The **Conversion Value** remained at $1.10 per pound U for the third consecutive month. No conversion transactions are reported this month.

In the *Market Opportunities* section of this Report, the listing of inquiries to buy or sell conversion services in the secondary market indicates the emergence of several conversion buyers, some of which have longer term needs. However, available conversion supply continues to outweigh demand by a significant margin. In the zero to one year time frame, available supply exceeds inquiries to purchase by six to one. Thus, the increase in demand for secondary market conversion services in the near term continues to be small in relation to the overabundant supply situation and effectively constrains any significant upward price movement for the time being. The price terms being discussed in transactions currently under negotiation substantiate this conclusion.

There are five natural uranium transactions reported this month:

1. A US reactor vendor made an intermediate term sale to a US producer for between 300 thousand and 600 thousand pounds U_3O_8. Deliveries are scheduled for 1983 and 1984.
2. A US utility made a spot sale to a non-US buyer for between 300 thousand and 600 thousand pounds U_3O_8.
3. A US producer sold a US utility between 100 thousand and 300 thousand pounds U_3O_8, with delivery scheduled for 1982.
4. A US intermediary made a small spot sale to a US producer. Delivery is immediate, and the quantity is less than 50 thousand pounds U_3O_8.
5. One US utility sold another between 300 thousand and 600 thousand pounds U_3O_8. Delivery will take place in 1982.

There are no conversion transactions reported this month.

AFRICA

A US delegation including representatives of the Department of Energy (DOE), Department of State and the Arms Control and Disarmament Agency met recently with South African authorities to discuss enrichment safeguards. While no specific announcements have been made, it is known that the US is searching for a politically acceptable rationale that

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will allow the export to South Africa, from the U.S. of the enriched uranium for the first core of Koeberg unit 1. South Africa delivered the feed to DOE in August 1981 and took delivery of enriched product on August 31, although the export of the product remains embargoed.

Concurrently, it has been learned that South Africa is preparing to designate a second nuclear plant site, on the southeastern coast, west of Cape St. Francis. The decision to proceed with a second nuclear project would seem to imply that the South Africans are confident about the availability of enrichment supply. This, in turn, suggests confidence in their own enrichment project or their ability to procure enrichment services elsewhere, in spite of their current problems.

Third quarter production figures from South African gold-uranium operations have recently been released and are presented in Table 1. The total represents a 2.73 percent decline from the second quarter. The East Dreifontein and West Dreifontein operations have merged to form Dreifontein Consolidated. However, uranium production still comes only from the West Dreifontein section.

West Rand Consolidated ceased uranium production on August 23, 1981 and put the uranium plant on standby.

Table 1
SOUTH AFRICAN GOLD-URANIUM PRODUCTION THIRD QUARTER 1981

Operation	Thousands of Pounds U_3O_8
Blyvoorvitzicht	175
Buffelsfontein	335
CHEMWES	370
ERGO	170
Harmony	335
Hartebeestfontein	240
J.M.S.	605
Randfontein	340
Vaal Reefs	955
West Dreifontein	140
West Rand Consolidated	55
Western Deep Levels	130
Total	3,850

AUSTRALIA

The Waterside Workers' and Seamen's Unions are maintaining their ban on uranium shipments from Australia. A recent attempt to ship about 600,000 pounds of U_3O_8 from Energy Resources of Australia's (ERA) Ranger mine from the port of Darwin was unsuccessful. The Seamen's Union is in a crucial position concerning exports because its members make up tug crews and crews of pilot vessels, without which ships are unable to enter or leave port or complete berthing maneuvers. The members' threats to refuse to service vessels carrying uranium have created sufficient discomfort among shipowners that they will not accept uranium cargo.

The Seamen's Union action is based on a 1980 uranium resolution passed by the Australian Council of Trade Unions (ACTU). The ACTU stated its support of a "policy of a moratorium on the mining, processing and export of uranium and the repudiation of non-Labor Government commitments until satisfactory safeguards are met." However, individual unions are free to accept or reject the ACTU resolution. The unions directly involved in the mining and milling of uranium are actively supporting the development of the industry and only the Seamen's Union has accepted the ACTU policy as binding on its members. The Waterside Workers' Union is supporting the Seamen's Union action and is refusing to load yellowcake on vessels as long as the Seamen's Union refuses to crew the ships carrying it.

The Australian government is unlikely to intervene in the situation until all avenues for reconciliation in this conflict have been explored by the uranium producers. In the interim, uranium is leaving Australian ports in limited amounts. A few months ago the Australian government "persuaded" a shipping line to carry material from Mary Kathleen Uranium Ltd. from the port of Brisbane and tug crews delayed the vessel by several days and threatened to effectively ban the vessel in all Australian ports should the shipper again accept a uranium cargo. Queensland Mines Ltd. has chartered foreign barges to carry its product but needs the cooperation of a variety of fringe services on the wharf to load them. Thus it would appear that Queensland remains vulnerable to union actions as well.

Pilot plant tests on Yeelirrie ore undertaken by the Western Mining Corp. (WMC) Esso Exploration and

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Production Australia Inc. joint venture will be completed by the end of the year. The successful research has established the metallurgical basis for the feasibility study planned for next year, and WMC is confident that the mine/mill complex will be committed for construction upon completion of feasibility work at the end of 1982, with production scheduled to start in 1985. The technical efforts are accompanied by a vigorous marketing drive.

Australia's Federal Budget for 1981-82 which lays down the economic policy for the next financial year, includes a tax law amendment which will have serious consequences for new resource developments. The budget is very close to legislative approval pending the completion of debate on a few minor issues. Under the old tax provisions a mining company could write off 67 percent of its allowable capital investment over the first five years. Now, it will be able to write off only 41 percent. Under the old provisions, it would have written off 89 percent after ten years; after the proposed amendments, the company will have written off 65 percent over the same period.

These new rates are lower than those for the less risky manufacturing industry (51 percent and 76 percent respectively). The effects of these provisions on early cash flow and the financing ability of developers will be significant. With equity markets weak, prevailing interest rates high and loan terms shorter, the viability of projects depends on high cash flow in the early years. Among uranium developments, the Jabiluka project is likely to be the most seriously affected by these changes owing to its high capital and infrastructure components. It is Nuexco's opinion that neither the Jabiluka, Koongarra, Honeymoon, Beverly, Yeelirrie nor Ben Lomond projects are economically feasible under current market conditions. If market prices for uranium increased substantially, and interest rates declined somewhat, the prognosis might be different.

The most recent round of Japanese and Australian safeguards negotiations ended after two weeks of talks without the conclusion of a bilateral agreement. Apparently, the Japanese found themselves still unable to accept the Australian policy, especially the inspection procedures. It is now very likely that the first shipments from the Ranger mine under contract with Japanese utilities will be delayed.

Wyoming Mineral Corp., a wholly-owned subsidiary of Westinghouse Corp., has sold its remaining Australian uranium interests to a local company Kratos Uranium NL for US $460,000. The sale involved interests in the Pandanus Creek and Jim Jim projects. This move completes Wyoming's retreat from uranium exploration in Australia. Earlier this year the company sold its 51 percent interest in the Lake Way project in Western Australia to Delhi International Oil Corp. and Vam Ltd.

On October 27 the Honeymoon uranium project in South Australia was given approval for development by the federal government. The project is currently owned by Mines Administration Pty. Ltd. (25.5 percent), Teton Exploration Drilling Co. Ltd. (25.5 percent) and Carpentaria Exploration Co. Pty. Ltd. (49.0 percent). Teton Exploration is partly owned by United Nuclear Corp. Resources Inc. Mines Administration is a wholly owned subsidiary of AAR Ltd. which is in turn owned by C.S.R. Ltd. Carpentaria is a wholly owned subsidiary of MIM Holdings Ltd.

With the government go ahead, pilot plant operations will begin, aiming to prove the feasibility of in-situ leaching, the first in Australia. The pilot plant is expected to take ten months to build. Commercial operation is anticipated in 1983 at about 100 tonnes U_3O_8 per year to be expanded to 450 tonnes U_3O_8 per year by 1985-86.

CANADA

Ontario Hydro announced during October that it will reduce the amount of uranium it takes under longterm contracts from Denison Mines Ltd. and Rio Algom Ltd. The revised agreement with Denison calls for a reduction of nine percent over the 31-year contract period and a one-year extension of deliveries (to 2012). A legal dispute over the development of Denison's Elliot Lake properties prompted the action which resulted in the settlement. The dispute arose over the production costs associated with a portion of the Elliot Lake deposit. The contract is based on the cost of production plus a minimum of Canadian $5 escalated per pound U_3O_8.

The 1978 uranium agreement between Ontario Hydro and Rio Algom is an output contract from Rio Algom's Stanleigh deposit and gives Ontario Hydro the option to reduce the annual deliveries by 15 percent. The announced delivery reductions results from the exercising of this option. The contract still calls for a total of 72 million pounds U_3O_8. However, the annual reductions will mean that deliveries under the 36-year contract will be extended over a longer period. Ontario Hydro will continue to provide the two producers interest-free loans for development of the properties.

The utility is anticipating the need for additional uranium supply in the late 1980's and early 1990's before a potential oversupply situation develops in the late 1990's. This demand can be filled by lower cost uranium, especially from western Canada. Given the high price of the uranium which Ontario Hydro is currently receiving, the opportunity to buy material near market price should be welcome.

EUROPE

The national energy programs of several European countries reflect continued uncertainty over the future of nuclear power. In Italy, a new national energy plan released a few months ago showed nuclear power generating 11.6 percent of Italian electricity by 1990. In 1980, only one-half of one percent was generated by nuclear power. Adding to the increased total is the 840 MWe Boiling Water Reactor (BWR) Caorso plant which was completed in 1978 and reached commercial full power operation last March. Already a part of the plan are two units at the Montalto di Castro site near Rome, each 982 MWe. Construction work on this project began two and one half years ago but political pressure has resulted in limited progress. According to the plan, the majority of the new nuclear energy is to come from four planned new units, each generating 1,000 MWe, scheduled for operation by 1990. The plan foresees three to four additional 1,000 MWe units being onstream by 1991. All would be Pressurized Water Reactors (PWR).

The energy plan includes increased coal-powered generating plants and additional research on alternate energy sources. The proposal, presented by the Industry Minister, must now be approved by the national government and the Italian Parliament. Even then, acceptance on the regional level must be gained because the Italian constitution does not give the central government a large amount of executive authority. Given the severity of the Italian need for additional power, it is hoped that the various political parties will develop a strategy to support the new energy plan and enforce it at the local level. The present government, as a first step, is looking to site three new power stations, two of them nuclear, by the end of the year. The success of this initial move could indicate the direction of nuclear power in Italy. If the country continues to experience political and social problems, it will be very difficult to realize the government's energy goals.

The issue of nuclear power in The Netherlands recently provoked dissension within the Labor Party following its formation of a new coalition government. The policy of the Labor Party had been to shut down Dodewaard, a 54 MWe experimental power station, and Borssele, a 450 MWe commercial station. However, the party was forced to drop this point during negotiations with the Christian Democrats and the Democrats 66, its partners in the new government. Instead, the new administration will undertake a six-month study of nuclear power.

The future of nuclear power in France was the subject of a much publicized, formal National Assembly debate in October. However, the debate was turned into a vote of confidence for the Socialist government to insure support for the Socialist energy policy. The Assembly approved the government's energy program by 331 votes for to 67 against.

According to the program, work will begin in 1982 and 1983 on six nuclear reactors as opposed to the nine which the previous government had proposed and four which a large number of Socialist deputies had wanted. This position would appear to satisfy the French nuclear industry which considered six to be the minimum acceptable. The forecast of slower growth in French electricity demand had led to expectations of a slowdown in the nuclear program.

During the election campaign, the Socialists had promised that the French themselves would take part in nuclear power decisions. The Prime Minister has now decreed that the municipal and, if necessary, the regional councils around the five sites frozen by the Socialist government on July 30 (Civaux, Cattenom, Golfech, Pellerin and Chooz) shall decide whether to allow construction of nuclear plants (or further units) on these sites. Voting has already started. However, should the local population vote against a nuclear plant and the government believe that its construction is in the national interest, the final decision shall rest

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with the National Assembly (where there is a large Socialist majority).

The Prime Minister has also ordered the formation of regional energy agencies and local commissions so that information on nuclear power shall be decentralized. Part of his appeal to the people to support nuclear power was the idea that no more jobs could be created without economic growth and no growth could be achieved without energy.

There has been some confusion in reports from France on the names of the six plants which will be started in 1982-83. The names of these plants and the sites frozen do not necessarily correspond. It seems likely that four of the six plants mentioned in the debate will be the 900 MWe Chinon and the 1300 MWe Nogent-Sur-Seine unit 2 and Penly units 1 and 2, with two more plants to be chosen from the frozen sites.

At this point only the plans for 1982-83 are being discussed. The Socialists intend to return to 5-year planning, but because of the time involved to do so, decided to take measures for the next two years in the interim.

The French government has approved the modernization and expansion of the La Hague reprocessing plant where work on the building of UP3 is scheduled to start in March 1982, at the earliest. France has stated publicly its intention to honor its reprocessing obligations.

Until July 1, 1981, fuel fabrication was the only step in the French fuel cycle in which Cogema lacked a substantial shareholding. From that date, Framatome (30 percent subsidiary of the Commissariat à l'Energie Atomique (CEA)) and Cogema (100 percent subsidiary of the CEA) have joined forces to set up two companies in which they are equal shareholders.

The first new company is Fragema which is responsible for the design and sale of fuel assemblies and related components and services for PWRs. It is made up of the former fuel division of Framatome which moved from Paris to Lyon about two years ago.

The second company is Cogema-Framatome-Combustible (meaning fuel)(CFC) which is responsible for the construction and operation of a fuel assembly fabrication plant being built on the Pierrelatte site. It is scheduled for completion at the end of 1983 with a capacity of 500 tonnes of contained uranium per year.

Present French fabrication capacity is 800 tonnes per year from the Franco-Belge de Fabrication du Combustible (FBFC) plants at Romans (France) and Dessel (Belgium). On October 16, it was announced that this capacity would be expanded to 1,000 tonnes per year by 1983 with a 200 tonnes extension at the Romans plant. This expansion was planned before the Socialists won the French election.

Total French fabrication capacity will be, therefore, 1,500 tonnes per year by 1983. In order to assure Nuclear Steam Supply System (NSSS) customers of Framatome that only one supplier retains entire contractual responsibility for both the NSSS and fuel contracts, it has been decided that Framatome will continue to be responsible for first core supply together with the NSSS. Fragema will execute such contracts on behalf of Framatome, the CFC and FBFC companies then carrying out fuel assemblies fabrication.

FBFC is owned 87 percent by Eurofuel (which is owned 51 percent by Pechenay Ugine Kuhlman (PUK) and 49 percent by Framatome) and 13 percent by Mettalurgie et Mecanique Nucleaire (MMN).

The tie up between Framatome and Cogema had long been expected, but PUK's imminent nationalization could change the fuel fabrication picture still further.

Recent developments in Switzerland have focused national attention on the nuclear plant at Kaiseraugst near Basel. In mid-October, the president of the Kaiseraugst consortium stated on television that, contrary to media reports, his group was definitely not proposing to withdraw its application for construction.

The basis of the media reports was an earlier incident which was interpreted to mean that the utility was prepared to withdraw from the project. Specifically, in September of this year the utility sent the Federal Council (Bundesrat) of the Swiss Parliament a letter in which it asked for government guarantee of compensation in case the utility pulled out of the project. This marked the first time in 13 years that the utility had ever alluded to the fact that it might not proceed. The letter was received just three days before the Federal Council was scheduled to give its decision to Parliament on the need for the project and project approval. As a result of the letter, the Council decided to forgo a determination at that time.

However, the consortium president, along with restating his commitment to the project, formally asked the government to proceed with its deliberations. He stated that the project owners are firmly in agreement to move forward with the project as soon as government endorsement is given. The Council previously had acknowledged that it believes the country will need another 1,000 MWe generating capacity by the early 1990's.

On October 28 the Federal Council reversed its recent neutral position and agreed to issue the consortium a permit to proceed with the project. The issue is now formally before Parliament for ratification. A yes vote from both houses of Parliament is required under the ratification process. Frequently the recommendations of the Federal Council, acting as an executive group, are adopted by Parliament. In this case, heated discussions and a long debate period are anticipated. There are strong emotions concerning nuclear power and more importantly, millions of Swiss francs at stake, either to be paid eventually by the government, or to remain the responsibility of the project stockholders. Each house will appoint a commission to study the issue in more detail before there is a full debate. This process could take 12 to 18 months according to some sources.

Following the Federal Council's approval, the anti-Kaiseraugst forces organized 15,000 people to march on the site to protest the decision in favor of Kaiseraugst. The political ramifications may endanger the Graben nuclear plant project, slated to follow the Kaiseraugst project on the construction list.

If the Kaiseraugst plant were authorized, it would not be expected to be operational before 1990; this date allows for continued government regulatory delays and anti-nuclear activity through court action. Government approval will aid in reducing the controversy surrounding the plant, but will certainly not eliminate it, thus leading to further government reviews and delays as the plant proceeds through construction. The political struggle facing the project could be too great to overcome.

The French nuclear plants, Blayais unit 1 and Gravelines unit 1 reached nominal capacity on August 7 and 9 respectively. Dampierre unit 4 was connected to the grid on August 18.

West Germany's newest nuclear power plant, the Grafenrheinfeld 1300 MWe PWR unit, is expected to achieve its first criticality within a few days. If further startup tests proceed well, the unit could be in commercial operation by the end of this year. The unit was ordered from Kraftwerk Union in January 1975 by the Bayernwerk utility. It is reported that the unit's power generation costs will be much cheaper as compared to an oil fired plant and will result in a savings of over 300 million DM per year to the electricity users in Bayernwerk's distribution area.

FAR EAST

Representatives of large Australian and US uranium companies have recently visited Japan seeking financing for new production ventures. A weak uranium market combined with high interest rates and prevailing contracting practices make it difficult to borrow from conventional sources so sellers are once again turning to buyers. With their preference for supply security, long-term planning, and diversity, the Japanese are a natural target for requests to finance uranium production ventures. However, it seems likely that the Japanese utilities will react cautiously to such overtures for the very reasons the sellers find them necessary.

Until recently, discussions of Japanese involvement in an Australian enrichment project have been conducted primarily by the two governments. However, the recent formation of a Japanese committee to evaluate the feasibility of such a project marks the beginning of involvement by the private sector. The committee includes Power Reactor and Nuclear Fuel Development Corp. (the quasi-governmental organization responsible for developing Japan's own centrifuge technology), the utilities (led by Tokyo Electric Power Co. and Kansai Electric Power Co.) and the manufacturers (Toshiba, Hitachi and Mitsubishi Heavy Industries). The Uranium Enrichment Group of Australia (UEGA) will send a representative to Japan to participate in this feasibility study. UEGA is also undertaking its own two and one-half year study of the feasibility of establishing a commercial uranium enrichment facility in Australia.

There are good reasons for the two nations to pursue this idea jointly. An Australian enrichment venture would not likely be viable without Japanese customers. On the other hand, the Japanese are likely to be very interested in any new enrichment endeavor as an additional supply source. Even though the Japanese are mounting their own enrichment effort, support of and partial reliance on an Australian enrichment facility would be in keeping with the Japanese propensity to think long term and to diversify sources of supply.

Any reliance by Japan on Australia as an enrichment supplier suggests, of course, a continuing and substantial reliance on Australian uranium sources. While Australia has long been a raw materials supplier to Japan, the introduction of enrichment into the situation might lead to Australia's becoming Japan's major source of uranium. Of course, Australian producers are fully aware of the situation and the implications for Australia's developing uranium industry.

UNITED STATES

This month the nuclear industry in the US received a badly needed boost from two quarters. Nuclear Regulatory Commission (NRC) Chairman Palladino stated that the Commission is preparing to grant operating licenses to 33 units by the end of 1982. This is in contrast to NRC's previous pessimistic statement of its ability to process only about six licenses per year.

Also this month President Reagan issued his long awaited statement on nuclear energy. Both Mr. Reagan's statement and that of the NRC Chairman are quite optimistic compared to those of their predecessors.

President Reagan's statement is reproduced below in its entirety.

President Reagan's Statement on Nuclear Power

A more abundant, affordable, and secure energy future for all Americans is a critical element of this Administration's economic recovery program. While homeowners and business firms have shown remarkable ingenuity and resourcefulness in meeting their energy needs at lower cost through conservation, it is evident that sustained economic growth over the decades ahead will require additional energy supplies. This is particularly true of electricity, which will supply an increasing share of our energy.

If we are to meet this need for new energy supplies, we must move rapidly to eliminate unnecessary government barriers to efficient utilization of our abundant, economical resources of coal and uranium. It is equally vital that the utilities—investor-owned, public, and co-ops—be able to develop new generating capacity that will permit them to supply their customers at the lowest cost, be it coal, nuclear, hydro, or new technologies such as fuel cells.

One of the best potential sources of new electrical energy supplies in the coming decades is nuclear power. The US has developed a strong technological base in the production of electricity from nuclear energy. Unfortunately, the Federal Government has created a regulatory environment that is forcing many utilities to rule out nuclear power as a source of new generating capacity, even when their consumers may face unnecessarily high electric rates as a result. Nuclear power has become entangled in a morass of regulations that do not enhance safety but that do cause extensive licensing delays and economic uncertainty. Government has also failed in meeting its responsibility to work with industry to develop an acceptable system for commercial waste disposal, which has further hampered nuclear power development.

To correct present government deficiencies and to enable nuclear power to make its essential contribution to our future energy needs, I am announcing today a series of policy initiatives:

1. I am directing the Secretary of Energy to give immediate priority attention to recommending improvements in the nuclear regulatory and licensing process. I anticipate that the Chairman of the Nuclear Regulatory Commission will take steps to facilitate the licensing of plants under construction and those awaiting licenses. Consistent with public health and safety, we must remove unnecessary obstacles to deployment of the current generation of nuclear power reactors. The time involved to proceed from the planning stage to an operating license for new nuclear power plants has more than doubled since the mid-1970s and is presently some 10-14 years. This process must be streamlined, with the objective of shortening the time involved to 6-8 years, as is typical in some other countries.

2. I am directing that government agencies proceed with the demonstration of breeder reactor technology, including completion of the Clinch River Breeder Reactor. This is essential to ensure our preparedness for longer-term nuclear power needs.

3. I am lifting the indefinite ban which previous Administrations placed on commercial reprocessing activities in the United States. In addition, we will pursue consistent, long-term policies concerning re-

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processing of spent fuel from nuclear power reactors and eliminate regulatory impediments to commercial interest in this technology, while ensuring adequate safeguards.

It is important that the private sector take the lead in developing commercial reprocessing services. Thus I am also requesting the Director of the Office of Science and Technology Policy, working with the Secretary of Energy, to undertake a study of the feasibility of obtaining economical plutonium supplies for the Department of Energy by means of a competitive procurement. By encouraging private firms to supply fuel for the breeder program at a cost that does not exceed that of government-produced plutonium, we may be able to provide a stable market for private sector reprocessing, and simultaneously reduce the funding needs of the US breeder demonstration program.

4. I am instructing the Secretary of Energy, working closely with industry and state governments, to proceed swiftly toward deployment of means of storing and disposing of commercial high-level radioactive waste. We must take steps now to accomplish this objective and demonstrate to the public that problems associated with management of nuclear waste can be resolved.

5. I recognize that some of the problems besetting the nuclear option are of a deep-seated nature and may not be quickly resolved. Therefore, I am directing the Secretary of Energy and the Director of the Office of Science and Technology Policy to meet with representatives from the universities, private industry and the utilities and requesting them to report to me on the obstacles which stand in the way of increased use of nuclear energy and the steps needed to overcome them in order to assure the continued availability of nuclear power to meet America's future energy needs not later than September 30, 1982.

Eliminating the regulatory problems that have burdened nuclear power will be of little use if the utility sector cannot raise the capital necessary to fund construction of new generating facilities. We have already taken significant steps to improve the climate for capital formation with the passage of my program for economic recovery. The tax bill contains substantial incentives designed to attract new capital into industry.

Safe, commercial nuclear power can help meet America's future energy needs. The policies and actions that I am announcing today will permit a revitalization of the US industry's efforts to develop nuclear power. In this way, native American genius—not arbitrary federal policy—will be free to provide for our energy future.

Table 2

DISTRIBUTION OF RELATIVE INVENTORY LEVELS OF US UTILITIES

Years of Forward Consumption In Inventory as of End of 1981	Number of Utilities
0 - 1	17
1 - 2	15
2 - 3	7
3 - 4	3
4 - 5	5
5 - 6	2
> 6	5

The distribution of relative inventory levels among US utilities is shown in Table 2. Relative inventory is the number of years' forward consumption which could be supplied by the utilities' 1982 beginning inventory. The majority of the 54 utilities or utility groups hold a zero to two year inventory, with the median at 1.7 years. Those holding more than two years' forward consumption usually are doing so because of nuclear plant delays combined with preexisting long term uranium contracts.

The US Department of Energy (DOE) is in the process of raising its prices for separative work under all three types of enrichment contracts. As of October 1, 1981 the DOE SWU price for holders of Long Term Fixed Commitment (LTFC) and Adjustable Fixed Commitment (AFC) contracts increased to $130.75 per SWU. The *published price* for Requirements contracts increased from $119.00 per SWU to $141.15 as of November 2, 1981. However, holders of Requirements contracts will see only an increase of $8.35 per SWU, since the *provisional ceiling charge* ($127.35 per SWU for the latter half of 1981) now applies.

Holders of Requirements contracts pay the lower of the published price or the ceiling charge. The ceiling charge is escalated every calendar half-year according to functions of costs of power and labor. Since power and labor cost data for a given period are not available until 60-90 days into the next, DOE determines a provisional ceiling charge to be used for billing purposes early in the current period. If the provisional ceiling charge is less than the published price, Requirements customers are invoiced at the provisional ceiling charge. When the final labor and power cost statistics are available, DOE computes the actual ceiling charge for the period and adjusts the invoices accordingly.

The most obvious effect of DOE's SWU price increases is to raise the cost of enriched uranium. Although DOE operates the enrichment facilities at a tails assay of 0.25 percent U_{235}, AFC contracts allow the customer to specify, within limits, the transaction tails assay. This "variable tails assay" option (VTAO) gives those customers the freedom to more closely approximate the optimum tails assay.

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the *ratio* of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. For a gaseous diffusion plant, there is an exact mathematical relationship:

$$\frac{C_f}{C_s} = (2X_f - 1)\log_e\left(\frac{X_f(1 - X_o)}{X_o(1 - X_f)}\right) + \frac{(X_f - X_o)(1 - 2X_o)}{X_o(1 - X_o)}$$

Where C_f is the cost of feed, C_s is the cost of a SWU, X_f is feed enrichment as a fraction, i.e. 0.00711, and X_o is the optimum tails assay as a fraction.

The above relationship is customarily solved graphically rather than analytically. The equation is plotted in the *Statistical Data* section of each month's Report. To use the plot, it is necessary only to calculate the ratio C_f/C_s and locate the corresponding optimum tails assay on the curve.

Effective October 1, 1981, the cost of separative work under fixed commitment contracts was raised to $130.75/SWU, while the cost of uranium feed remained stable. Given the relatively higher cost of enriching services, the optimum tails assay must increase. This higher tails assay would use more feed uranium and less separative work, minimizing the overall cost of enriched uranium needed to fabricate nuclear fuel.

For example, using this month's Exchange Value of $23.50 per pound U_3O_8 and this month's Conversion Value of $1.10 per pound U as UF_6 yields a feed price of $63.83 per kg U as UF_6. Therefore, the ratio C_f/C_s is $63.83/$130.75, or 0.49. The corresponding optimum tails assay, read from the figure, is approximately 0.31 percent U_{235}.

The optimum tails assay determined above is only a theoretical optimum. Even given fixed costs of separative work, the optimum tails assay still varies from one utility to another, depending on that utility's feed and conversion costs. Utilities customarily account for feed and conversion on the basis of historical cost, but they could use market value instead. Once the decision is made to use historical cost, it is not so obvious whether to use FIFO, LIFO, average cost of all feed presently held in inventory or actual cost of feed passing into the enrichment cascade during a given period. These difficulties are especially significant now, when there are large variations among the prices for current deliveries, the prices of material held in inventories and the price a utility could obtain on a resale. Even though the theoretical determination of optimum tails assay may be quite precise, application of the theory is most dependent upon the values assigned to the supposedly independent variables of U_3O_8 price and conversion price.

Finally, even if the above conflicts can be resolved, it is not necessarily true that a utility should operate at its optimum tails assay. DOE requires advance notice of customers' election of VTAO, so it may not be feasible to maintain optimum tails assay as prices change. Furthermore, it may be advisable for a utility to use a transaction tails assay well below optimum in order to avoid cancellation charges for excess SWU's under contract.

Given the past enrichment and natural feed price movements, the optimum tails assay can be expected to follow an upward trend. If AFC customers select higher transaction tails assays, the result will be an increase in natural uranium consumption over what it would have been at the operating tails assay of 0.20 percent U_{235}, which is also the transaction tails assay for Requirements contracts. For every one-hundredth of a percentage point increase in the transaction tails assay, uranium consumption increases about two percent in order to produce the same amount of enriched uranium. A higher average transaction tails assay would, therefore, mitigate some of the decrease in demand which has occurred over the past few years.

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FORECAST OF APPARENT FUTURE CONSUMPTION

This Report presents Nuexco's forecasts of Apparent Future Consumption of U_3O_8 and installed nuclear electric generating capacity, as of October 31, 1981. (As used by Nuexco, the term "consumption" refers to U_3O_8 entering the pipeline for fabrication into nuclear fuel.) Details of the forecasts are shown in Tables 3 and 4.

This forecast differs only slightly from that presented in Report 147, reflecting a substantially smaller change than might have been expected based on the public record. Virtually all of the cancellations and

Table 3

APPARENT FUTURE CONSUMPTION[1]
(millions of pounds U_3O_8)

BUYER GROUP	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
United States										
Reactors Now Operational	17.9	17.8	18.4	18.6	18.8	18.9	18.8	18.7	18.6	18.4
Now Under Construction	2.7	3.6	9.8	11.0	12.6	17.2	15.4	18.9	15.3	22.0
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—
US Subtotal	20.6	21.4	28.2	29.6	31.4	36.1	34.2	37.6	33.9	40.4
Europe										
Reactors Now Operational	17.3	16.8	17.7	18.4	18.8	18.9	18.9	18.4	17.6	17.1
Now Under Construction	6.5	8.8	18.8	14.2	16.1	20.6	20.4	23.1	20.2	20.3
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	8.8	5.4	5.9
Europe Subtotal	23.8	25.6	36.5	32.6	34.9	39.5	39.3	50.3	43.2	43.3
Far East[2]										
Reactors Now Operational	3.6	3.5	3.4	3.4	3.3	3.2	3.1	3.0	2.9	2.8
Now Under Construction	2.4	3.8	2.2	9.3	8.0	5.6	6.8	6.2	5.2	4.8
Now on Order	—0—	—0—	—0—	—0—	—0—	1.1	0.3	1.4	0.5	0.4
Far East Subtotal	6.0	7.3	5.6	12.7	11.3	9.9	10.2	10.6	8.6	8.0
Other Free World[3]										
Reactors Now Operational	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.8	1.8	1.7
Now Under Construction	0.2	2.4	3.8	3.2	3.2	4.1	4.3	3.6	3.0	3.4
Now on Order	—0—	—0—	—0—	—0—	—0—	0.7	0.6	0.4	0.7	1.1
Other Subtotal	2.3	4.5	5.9	5.3	5.2	6.8	6.8	5.8	5.5	6.2
FREE WORLD[3] TOTAL	52.7	58.8	76.2	80.2	82.9	92.3	90.5	104.3	91.2	97.9
WORLDWIDE BREAKDOWN BY STATUS										
Reactors Now Operational	40.9	40.2	41.6	42.5	42.9	43.0	42.7	41.9	40.9	40.0
Now Under Construction	11.8	18.6	34.6	37.7	39.9	47.5	46.9	51.8	43.7	50.5
Now on Order	—0—	—0—	—0—	—0—	—0—	1.8	0.9	10.6	6.6	7.4

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[1] Computed quantities of U_3O_8 which would be used under the given conditions to fabricate fuel for loading and reloading reactors operating, under construction or on order as of October 31, 1981. Compiled and computed on a reactor-by-reactor basis, quantities for each reactor are based on specific core characteristics, 0.25% tails assay, no recycling, 24-month lead time for procuring first cores and 18-month lead time for procuring each reload. Where reload schedule is not already known, these estimates assume reloads occur one year after commercial operating date and annually thereafter. Nuexco estimates of individual reactor capacity factors are used.

[2] Japan, Korea, People's Republic of China, Taiwan.

[3] Excludes Bulgaria, Czechoslovakia, German Democratic Republic, Finland (two Russian Reactors), Hungary, Poland, Romania, USSR.

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schedule delays which have been announced in the past year had already been incorporated into the forecast published in Report 147.

Methodology

The methodology used in developing the forecasts detailed in Tables 3 and 4 is summarized below:

1. Tails assay is assumed to be 0.25 percent U_{235}. For each increase of 0.05 percent U_{235} in the tails assay, reactor consumption rises by approximately nine percent.

2. Capacity factor for each reactor is forecast according to elapsed time since that reactor's date of commercial operation. The method is based upon the application of historical capacity factor data to a power curve of the form,

$$y = a\ x^b$$

Table 4

NUCLEAR ELECTRIC GENERATING CAPACITY[1] [2]
(thousands of MWe—net)

BUYER GROUP	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
United States										
Reactors Now Operational	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0
Now Under Construction	—0—	3.9	8.4	14.1	23.0	28.2	34.8	41.9	47.8	54.3
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—
US Subtotal	56.0	59.9	64.4	70.1	79.0	84.2	90.8	97.9	103.8	110.3
Europe										
Reactors Now Operational	48.3	48.1	48.1	48.0	48.0	47.4	47.4	47.1	45.4	43.9
Now Under Construction	0.9	10.7	20.1	25.7	37.6	43.3	47.5	54.9	61.0	66.7
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	9.1
Europe Subtotal	49.2	58.8	68.2	73.7	85.6	90.7	94.9	102.0	106.4	119.7
Far East[3]										
Reactors Now Operational	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8
Now Under Construction	—0—	0.9	4.7	7.2	8.1	15.7	19.6	20.5	22.2	23.1
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	1.1	1.1	2.1
Far East Subtotal	16.8	17.7	21.5	24.0	24.9	32.5	36.4	38.4	40.1	42.0
Other Free World[4]										
Reactors Now Operational	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Now Under Construction	—0—	0.6	2.6	5.9	9.0	10.4	12.0	13.5	14.7	14.7
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	1.5	2.4
Other Subtotal	6.7	7.3	9.3	12.6	15.7	17.1	18.7	20.8	22.9	23.8
FREE WORLD TOTAL	128.7	143.7	163.4	180.4	205.2	224.5	240.8	259.1	273.2	295.8
WORLDWIDE BREAKDOWN BY STATUS										
Reactors Now Operational	127.8	127.6	127.6	127.5	127.5	126.9	126.9	126.6	124.9	123.4
Now Under Construction	0.9	16.1	35.8	52.9	77.7	97.6	113.9	130.8	145.7	158.8
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	1.7	2.6	13.6

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[1] Installed as of year end.

[2] Uses Nuexco estimates of commercial operating dates.

[3] Japan, Korea, People's Republic of China, Taiwan.

[4] Excludes Bulgaria, Czechoslavakia, German Democratic Republic, Finland (two Russian reactors), Hungary, Poland, Romania, USSR.

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Table 5

COMPARISON OF THIRTY YEAR URANIUM REQUIREMENTS (MTU/GWe) FOR PWR PLANTS OF CURRENT AND IMPROVED DESIGN BETWEEN INFCE[1] AND NUEXCO[2]

		Nuexco Assumption for Plants Operating in:		INFCE Improved Design Leading to Uranium Savings of:	
	Current Design	1985	1990	15%	30%
INFCE[1] (MTU/GWe)	4,350			3,700	3,040
Nuexco[2] (MTU/GWe)	4,350	4,200	3,930		
Relative Improvement (%)	Base	3.4	9.7	15	30

[1] International Nuclear Fuel Cycle Evaluation, International Atomic Energy Agency, Vienna, 1980: Volume 8, Advanced Fuel Cycle and Reactor Concepts, Report of INFCE Working Group 8, pages 53-67. Adapted from Table V (page 67).

[2] Nuexco data normalized to INFCE conditions.

where:

y = annual capacity factor in percent;
x = years since date of commercial operations;
a and b are empirically determined constants.

It is a commonly held belief that achievable capacity factor varies with reactor size. Nuexco grouped the world's reactors according to region and type (US LWR's, CANDU's, European LWR's, AGR's, etc.)

Applying a simple regression analysis to historical operating data, Nuexco determined the constants *a* and *b* for each grouping of reactors. In the range of 150 MWe to 1,250 MWe, differences in reactor size had no significant effect on capacity factor, within the limits of the analysis. Using this method of predicting capacity factor reduces forecast consumption by a worldwide average of approximately ten percent.

3. Reactor physics improvements are incorporated into the forecast as indicated in Table 5.

The two principal forces stimulating the development of more efficient fuel are:

a. Competition among fuel fabricators, particularly for reload fuel orders. This has led to more efficient fuel designs being proposed by the fabricators.

b. The trend toward refueling cycles of eighteen months or longer.

Each of these forces acts to increase the energy content in a given fuel rod. The effect is to reduce the uranium weight in the fuel rod or to increase the average fuel exposure or both. Of course, these changes lead to increases in average levels of enrichment and in the average expected capacity factor. Thus, essentially all important variables in the uranium consumption calculation for reload fuel (and initial core fuel to a lesser extent) will change. These changes in fuel design variables apply to essentially all plants which entered commercial operation after January 1969.

The INFCE report referenced in Table 5 above discusses nine methods for improving uranium utilization in LWR plants:

a. Increased burnup (MWD/MTU)
b. Lattice changes
c. Spectrum shift
d. Enrichment zoning, including blankets
e. Full use of early batches of startup core
f. Improved fuel management and control design
g. End-of-cycle coastdown
h. Reconstitution/inversion of BWR fuel
i. Increased frequency of refueling

The INFCE report postulated improvements ranging from 15 to 30 percent. Nuexco, believing that the INFCE targets were too optimistic for general application to LWR plants, chose to use improvements of 3.4 percent by 1985 and 9.7 percent by 1990, as shown above. Nuexco's assumption of modest improvements in uranium utilization was implemented wholly by increasing fuel exposure. The forecast discounted the other eight areas of fuel improvement potential.

A similar approach was followed for heavy water reactor plants where modest improvements in uranium utilization were assumed by 1985, but larger gains were instituted by 1990 through the use of

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slightly enriched uranium (1.20 percent U_{235}) in reload fuel. For conservatism, no improvements were assumed for gas-cooled reactor plants.

4. Factors considered in forecasting additions to installed capacity are:

a. Construction progress to date for individual nuclear plants, and the owner utility's construction experience for conventional as well as nuclear units;

b. The owner utility's financial condition and the estimated likelihood of relief from ratemaking bodies;

c. Forecasts of growth in demand for electricity;

d. Societal constraints, such as the active opposition of anti-nuclear pressure groups;

e. Institutional constraints, such as the US NRC caseload.

5. Uranium is deemed to have been consumed when it has entered the enrichment-fabrication pipeline for ultimate use in a reactor.

6. Reactor loading is calculated for each reactor type, based on its particular reactor physics.

7. The forecasts assume that:

a. U_3O_8 deliveries for first cores predate commercial operation by two years;

b. U_3O_8 delivery for each reload predates refueling outage by 18 months.

8. Using the assumptions listed above, the consumption for a given reactor can be computed as a function of capacity factor, tails assay and commercial operating date.

9. Actual commercial operating dates can vary widely from published dates. Nuexco uses the best information available, much of it from unpublished sources, to prepare its own forecasts of operating dates. Such information often changes more frequently than does public information; Nuexco attempts to anticipate such changes as much as possible.

Limitations

Limitations of the forecasts detailed in Tables 3 and 4 are as follows:

1. Forecasts of Apparent Future Consumption are not forecasts of actual uranium demand. Rather, these forecasts comprise a portion of uranium demand more commonly referred to as reactor demand or reactor requirements. As indicators of the amount of uranium which will be needed to fuel the reactors under consideration, these forecasts should be regarded as relatively hard demand in the sense that this portion of demand is quite insensitive to uranium prices. Market demand for the assumed pattern of capacity additions can be higher or lower, depending on user's inventory policies.

2. Factors which can cause demand to exceed Apparent Future Consumption are:

a. Utility buyers plan their procurement strategies to achieve a very high probability of having access to at least enough uranium to meet commitments as they arise;

b. Accelerated reactor construction schedules can advance the dates of uranium need;

c. Buyers may elect to purchase uranium in excess of need, simply to enhance security of supply;

d. Utility obligations to suppliers of fuel cycle services such as conversion, enrichment or fabrication, may require earlier purchase of uranium than a reactor's operating schedule would otherwise indicate.

3. Demand can fall short of Apparent Future Consumption if uranium inventories are reduced in order to fill needs which would otherwise appear as demand.

4. These forecasts make no provision for orders not yet placed. Only the consumption associated with reactors operating, under construction or on order are included.

5. Reactors fueled by the USSR are excluded from Nuexco's forecasts. Although Soviet bloc reactors account for substantial demand, Soviet participation in uranium trading in the Western market has been negligible and appears likely to remain so.

SUPPLY AND DEMAND ANALYSIS

The supply-demand analysis resulting from Nuexco's most recent forecasts of production and consumption of uranium is presented in Table 6 (WOCA) and Table 7 (US). Conclusions which may be drawn from the analysis include the following:

1. Table 6 shows forecast production exceeding forecast consumption in each year through 1990, implying that supply and demand will be balanced by an annual net increase in inventory. In actual practice, if supply exceeded demand over an extended period, the necessary balance would probably result from a combination of inventory purchases and reduced production.

2. The forecast inventory of approximately 426 million pounds of U_3O_8 equivalent as of January 1, 1982 represents slightly more than five years of forward

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Table 6

URANIUM SUPPLY-DEMAND BALANCE: WOCA[1]

(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION[2]										
Operating Production Centers	110.6	100.4	95.5	91.4	85.1	79.8	81.0	80.6	80.5	79.4
Facilities Under Construction	0.4	9.4	11.1	12.8	14.3	14.3	14.1	14.1	14.1	14.1
Planned Facilities	—0—	—0—	—0—	3.6	8.4	9.6	9.6	13.6	13.6	13.6
Total	111.0	109.8	106.6	107.8	107.8	103.7	104.7	108.3	108.2	107.1
less										
CONSUMPTION[3]	52.7	58.8	76.2	80.2	82.9	92.3	90.5	104.3	91.2	97.9
equals										
NET INVENTORY INCREASE	58.3	51.0	30.4	27.6	24.9	11.4	14.2	4.0	17.0	9.2
plus										
BEGINNING INVENTORY	367.8[4]	426.1	477.1	507.5	535.1	560.0	571.4	585.6	589.6	606.6
equals										
ENDING INVENTORY	426.1	477.1	507.5	535.1	560.0	571.4	585.6	589.6	606.6	615.8
RELATIVE INVENTORY (years)[5]	5.2	5.4	5.5	5.6	5.8	5.9	5.9	6.0	6.1	6.2

[1] World outside Communist areas

[2] Nuexco Report 158, Table 3

[3] This Report, Table 3

[4] Nuexco estimate

[5] For each year, Relative Inventory equals the number of years' forward consumption which could be supplied by that year's Beginning Inventory.

consumption. Inventory will increase steadily throughout the decade until it reaches approximately 600 million pounds U_3O_8 equivalent by 1990. Relative inventory is quite stable, however, increasing gradually from 5.2 years' forward consumption in 1981 to 6.2 years' forward consumption in 1990.

3. If actual demand is to be sufficient to support production from other production centers planned, but not yet under construction, it may arise from new reactor orders, or from political or national policy considerations. However, it is more likely that a major driving force behind any such additional production entering the market would be the displacement of other higher-cost production centers.

Table 7 shows Nuexco's analysis of forecast uranium supply and demand balance for the US. By reviewing the US situation alone, any potential market for imports or new US production can be identified. The analysis in Table 7 is of the same basic form as that of Table 6 (WOCA), but the US analysis includes an adjustment for *firm* US import-export commitments. The current US import-export balance is summarized in Table 8. Based on the US supply-demand balance, it may be concluded that:

1. In the US, consumption is forecast to exceed production annually, beginning in 1983. Forecast uranium production in 1985 is approximately one-half the 1981 domestic production, whereas Apparent Future Consumption increases by more than 50 percent between 1981 and 1985. By 1990, that ratio drops to 37 percent.

2. Table 7 shows an annual US supply deficit beginning in 1983 and rising to more than 25 million pounds U_3O_8 by 1990. Without additional imports or more US production, US inventory would decline to a level equivalent to approximately 18 months' forward consumption by 1990.

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Table 7

URANIUM SUPPLY-DEMAND BALANCE: US
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION[1]										
Operating										
Conventional Mills	28.7	19.6	15.9	14.1	12.7	9.7	9.7	9.3	9.3	8.8
Unconventional Sources	7.2	7.7	6.8	5.5	5.1	5.1	5.1	5.1	5.1	4.3
Subtotal	35.9	27.3	22.7	19.6	17.8	14.8	14.8	14.4	14.4	13.1
Under Construction (as of 9/30/81)	0.3	0.6	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5
Shutdown or Cancelled (as of 9/30/81)	1.0	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—
Total	37.2	27.9	23.4	20.3	18.5	15.5	15.3	14.9	14.9	13.6
less										
CONSUMPTION[2]										
Reactors now Operational	17.9	17.8	18.4	18.6	18.8	18.9	18.8	18.7	18.6	18.4
Now Under Construction	2.7	3.6	9.8	11.0	12.6	17.2	15.4	18.9	15.3	22.0
Now on Order	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—	—0—
Total	20.6	21.4	28.2	29.6	31.4	36.1	34.2	37.6	33.9	40.4
plus										
NET IMPORTS (EXPORTS)[3]	(2.1)	0.7	0.8	2.6	0.4	1.9	1.0	1.4	1.5	1.5
equals										
SUPPLY SURPLUS (DEFICIT)	14.5	7.2	(4.0)	(6.7)	(12.5)	(18.7)	(17.9)	(21.3)	(17.5)	(25.3)
plus										
BEGINNING INVENTORY[4]	147.8	162.3	169.5	165.5	158.8	146.3	127.6	109.7	88.4	70.9
equals										
ENDING INVENTORY	162.3	169.5	165.5	158.8	146.3	127.6	109.7	88.4	70.9	45.6
RELATIVE INVENTORY[5] (yrs.)	5.5	5.5	5.3	4.9	4.6	4.1	3.5	2.9	2.3	1.8

[1] Nuexco Report 158, Table 1

[2] Nuexco Report 157, Table 6

[3] This Report, Table 8

[4] "US Uranium Market Developments"; S. Victoria Krusiewski and David C. Thomas; US DOE; Grand Junction, Colorado; October 1981.

[5] For each year, Relative Inventory equals the number of years' forward consumption which could be supplied by that year's Beginning Inventory.

Methodology

1. The two most critical assumptions in this type of analysis are:

a. Outside the US, supply and demand will be balanced by inventory accumulation and increased exports to the US, rather than by reducing production.

b. In the US, supply and demand will be balanced by inventory liquidation and increased imports, rather than by reducing consumption. It is very possible that some US utilities' preference for domestic supply will induce them to subsidize some otherwise uneconomic US production, but Nuexco's interpretation of US utilities' attitudes indicates that this effect will be neither widespread nor substantial.

2. Another critical variable in the supply-demand analysis is the degree to which producers having

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Table 8

US IMPORT-EXPORT BALANCE
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
IMPORTS										
Annual	7.1	7.1	5.9	6.2	3.6	3.7	2.8	2.8	2.8	2.8
Cumulative	7.1	14.2	20.1	26.3	29.9	33.6	36.4	39.2	42.0	44.8
EXPORTS										
Annual	9.2	6.4	5.1	3.6	3.2	1.8	1.8	1.4	1.3	1.2
Cumulative	9.2	15.6	20.7	24.3	27.5	29.3	31.1	32.5	33.8	35.0
NET IMPORTS (EXPORTS)										
Annual	(2.1)	0.7	0.8	2.6	0.4	1.9	1.0	1.4	1.5	1.5
Cumulative	(2.1)	(1.4)	(0.6)	2.0	2.4	4.3	5.3	6.7	8.2	9.7

existing contracts will elect to purchase rather than produce uranium. This applies especially to US producers, since the average cost of production in the US is so high.

3. Forecasts of Apparent Future Consumption take no account of planned reactors or any reactors not yet ordered. Consequently, consumption forecasts will understate actual demand by the amount attributable to unordered reactors.

4. Inventory refers to uranium (U_3O_8, natural UF_6, enriched UF_6) owned by utilities, reactor manufacturers, fuel fabricators and national organizations which procure uranium for commercial purposes. The inventory amounts do not include strategic stockpiles, such as those owned by the US DOE. Difficulties in accounting precisely for the variety of possible forms, location and ownership of inventory necessarily result in some uncertainty in estimating total world inventory. Nuexco's estimate of worldwide inventory as of the beginning of 1981 is approximately 426 million pounds U_3O_8 equivalent; however, the uncertainty factor of this estimate is ten to fifteen percent. More important is the fact that the primary conclusions of this analysis are not sensitive to beginning inventory variations of ten to fifteen percent.

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ESSAY

THE EXCHANGE VALUE: WHAT IT IS AND WHAT IT IS NOT

The decline in uranium prices during the past two and one-half years has focused increasing attention on the Exchange Value and its role as an indicator of uranium prices. This essay attempts to clarify what the Exchange Value is and what it is not.

Definition of Exchange Value

The Exchange Value, its definition and explanatory notes appear in each month's Report.

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

Evolution of the Definition

The Exchange Value has been published monthly since August 1968. Although Nuexco has adapted the definition in response to changing market conditions and to the quantity and quality of information available, the Exchange Value has, since its inception, been subjective in nature reflecting the judgment of Nuexco's senior staff. It describes, by means of price, the state of the uranium market as of the publication date of each Report.

The modifications in the definition of Exchange Value are numerous, but can be conveniently divided into three major phases.

a. For the first five years of the Nuexco Monthly Report (August 1968-October 1973), the various definitions of Exchange Value all reflected the existence of a buyer's market. Sellers competed aggressively for limited business, so they kept prices down. Exchange Values were strongly influenced and sometimes solely determined by the lowest price at which a producer would offer material for sale. Buyers would then usually be able to negotiate downward; this process yielded transaction prices which were below then current Exchange Value.

b. The second phase, the seller's market, lasted from November 1973 through May 1978. It would be too simplistic to suggest that the shift from a buyer's market to a seller's market could be placed so precisely in time, but for purposes of analysis it is convenient to define the period by Nuexco's revision of the Exchange Value definition in recognition of that shift.

During the seller's market, buyers competed aggressively for limited supplies and prices were driven up steeply. Exchange Values were largely determined by the highest price at which a buyer would bid to begin negotiations. Sellers would then usually be able to negotiate upward, yielding transaction prices which were typically above then current Exchange Values.

c. The third phase (June 1978-present) began with a shift to a balanced market. In response to that shift, Nuexco revised the definition of Exchange Value to reflect input from buyers' bids, sellers' offers and transactions. The result is a definition which encompasses whatever relevant price information is available. In a buyer's market, there will be very few, if any, buyers' bids; in a sellers' market, there will be few sellers' offers, if any. The versatility of the current definition has been demonstrated in that while this third phase has seen substantial strengthening of the buyers' bargaining position—the market could now be best described as a buyers' market—the current definition of Exchange Value, adopted in June 1978, has served throughout the period.

For those readers who are interested, Nuexco has prepared a history of the Exchange Value which chronicles, month-by-month, changes in the definition, usage and derivation. Copies are available upon request.

Data Not Included

Certain data are excluded in determining the Exchange Value, namely, that price data associated with

(a) uranium delivered or to be delivered under old contracts, (b) uranium delivered under transactions that are not arm's length, and (c) uranium delivered as a consequence of contract renegotiations. Such exclusions include those prices that result from periodic negotiations under so-called "market price" type contracts. These prices are excluded because they are neither arm's length nor current. By definition, a prior contractual arrangement exists. Also excluded from consideration are *all* data where the future delivery price is defined in such a way that it cannot currently be determined, regardless of whether such data arise out of contracts, bids, offers or other sources. This exclusion applies particularly to contracts in which future delivery prices are expressed as a function of Exchange Value or any other independent variable.

Misinterpretations of Exchange Value

Although it should be self-evident, it is necessary to reiterate that the Exchange Value is no more than its definition. It is neither a quote nor a spot price, nor a near-term price, nor a long-term contract price. It is merely the Exchange Value.

Despite the specific language used to define it, media and industry usage has frequently attributed additional characteristics to the Exchange Value. Thus, a number of terms have been used in reference to the Exchange Value, describing it variously as "the market quote," "the spot price," "the market price," "the fair market price," "the world market price," "the fair world market price," and "the contract price." Uncritical acceptance of such terms and their implications has caused some confusion within the uranium industry, particularly as uranium prices have declined.

The recent decline in uranium prices has led to a situation in which the Exchange Value is lower than the production costs of some producers. While the drop in the Exchange Value is understandably distressing to producers (particularly to those having high production costs) it must be noted that the Exchange Value *in no way* relates to or defines cost of production; nor does it reflect the price level needed to provide a minimum acceptable rate of return on investment.

Exchange Value Is Not the Market Price

When used in reference to the uranium market, the term "market price" is so imprecise as to be meaningless. For example, for the calendar year 1980: (a) the average Exchange Value was $31.79 per pound U_3O_8; (b) the weighted average price reported by US DOE was $28.15 per pound U_3O_8; (c) individual buyers paid as little as $13.00 per pound U_3O_8 or as much as $59.00 per pound U_3O_8 for deliveries under long-term contracts. Given this data, one might reasonably be confused by the question, "What was the market price during 1980?" Clearly the Exchange Value is not the market price.

Without general industry agreement, the words "market price" have meaning only to the individual using them, or to the extent these words are specifically defined in a particular contract. If seller X and buyer Y agree to define "market price" in a given manner, they do so for their own purposes. Such agreement does not, however, constitute or imply more universal acceptance of their definition. On the contrary, reference to publicly available contracts will demonstrate that there are nearly as many different definitions of "market price" as there are contracts.

Exchange Value As One Indicator of Spot Prices

It is Nuexco's opinion that, at any given time, there is general agreement as to the approximate level of spot prices. Opinions may differ somewhat, but active market participants' estimates of spot market price levels will fall into a rather small range.

Three published measures—Nuexco's Exchange Value, Nuexco's Transaction Value and Nukem's spot market price range—are generally regarded as indicators of spot market price levels. Even though they are defined differently and are derived independently, comparisons of the three measures show that they yield very similar results. Consequently each of the three measures reinforces the validity of the other two as indicators of natural uranium spot market price levels.

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KEY LAKE PROJECT — PART II

Project Development

The development of the Key Lake uranium deposits represents the largest planned industrial project ever undertaken in northern Saskatchewan. The Key Lake Mining Corp. (KLMC) will invest about US $400 to $500 million for mine development and mill construction to recover a maximum of 12 million pounds U_3O_8 per year during a project life of 15 to 20 years. Uranium production will originate primarily from the Gaertner and Deilmann ore deposits; small satellite deposits known to occur along the trend of mineralization may be a source of production in later years. Each KLMC venture partner will receive his pro-rata share of yellowcake production in kind.

The preliminary plans for orebody development were formulated almost concurrently with orebody discovery. In order to complete the exploration and evaluation of each orebody, primarily the Deilmann, it was necessary to devise a plan to overcome certain surface conditions. Some of these aspects of the early planning were eventually incorporated into the final development strategy.

The terrain in the Key Lake area consists of low undulating hills and shallow lakes occurring in a general northeast to southwest trend. The surface is composed of highly weathered, unconsolidated fine to coarse Athabasca Sandstone and glacial debris ranging in particle size from clay-like to boulder-size material. The natural water table is not more than three meters below the ground surface. With these characteristics, access to strategic test drilling areas was limited by loose sand and surface water. The immediate problem of orebody delineation was overcome by lowering the water level of several lakes including Key Lake.

Initially it was necessary to lower the water level of eight lakes to complete delineation of the orebodies and to determine the engineering and economic feasibility of an exploitation plan. The lakes were partially drained by digging a canal system to carry the water northeast where it flowed into a larger river system. The drainage program began in 1978 under government approval relating to the early investigational stage of the project. The approval required that the water level of each lake be returned to the original level and that the natural water conditions be restored if the project did not proceed. As the project develops through several phases, the water level of about 15 lakes will be affected.

The details of project development, including environmental considerations, were formulated between 1977 and 1979. The final plan was submitted for approval to the proper Saskatchewan government agencies by KLMC in October, 1979. All development activity will be restricted to the 25 kilometer area already designated as the project site by the Department of Northern Saskatchewan. Figure 1 compares the original development schedule as proposed by KLMC in October, 1979 with the current schedule of activities. Time delays of three to six months have occurred in certain areas due to slow approval of the surface lease by the Department of Northern Saskatchewan. KLMC intends to bring the mine (Gaertner) and mill into production as originally scheduled regardless of imposed delays. All related work will be accelerated to meet the schedule.

According to the development plan, the Gaertner orebody will be stripped of overburden by first quarter 1983. However, in order to carry out overburden removal it was determined earlier that in addition to lowering the water level of several lakes and completely draining others, dewatering of the overburden would be necessary. The removal of the ground water from the overburden is necessary to provide stability to the undisturbed material for better pit slope control, easier movement of heavy equipment, and for minimizing any mining problems due to the accumulation of excess water at the lowest working levels of the mine. The rate of dewatering is scheduled to proceed overburden removal. Eventually, the ground water level will be maintained below the ore zone.

The initial test pumping for the dewatering process began in April, 1981; formal approval of the dewatering program was granted to KLMC in September. Currently, there are about 30 dewatering wells strategically located in and around the perimeter of the planned Gaertner pit area. The average pumping rate per well is presently maintained at about 200 gallons per minute which is already within 90 percent of the engineering design. Depending on ground water conditions, an estimated 80 to 110 million cubic feet of water will be pumped from the mine area per year to maintain favorable working conditions.

Orebody Development and Mining

The development of the Gaertner orebody is behind the original schedule due to a delay in the final approval of the Environmental Impact Statement.

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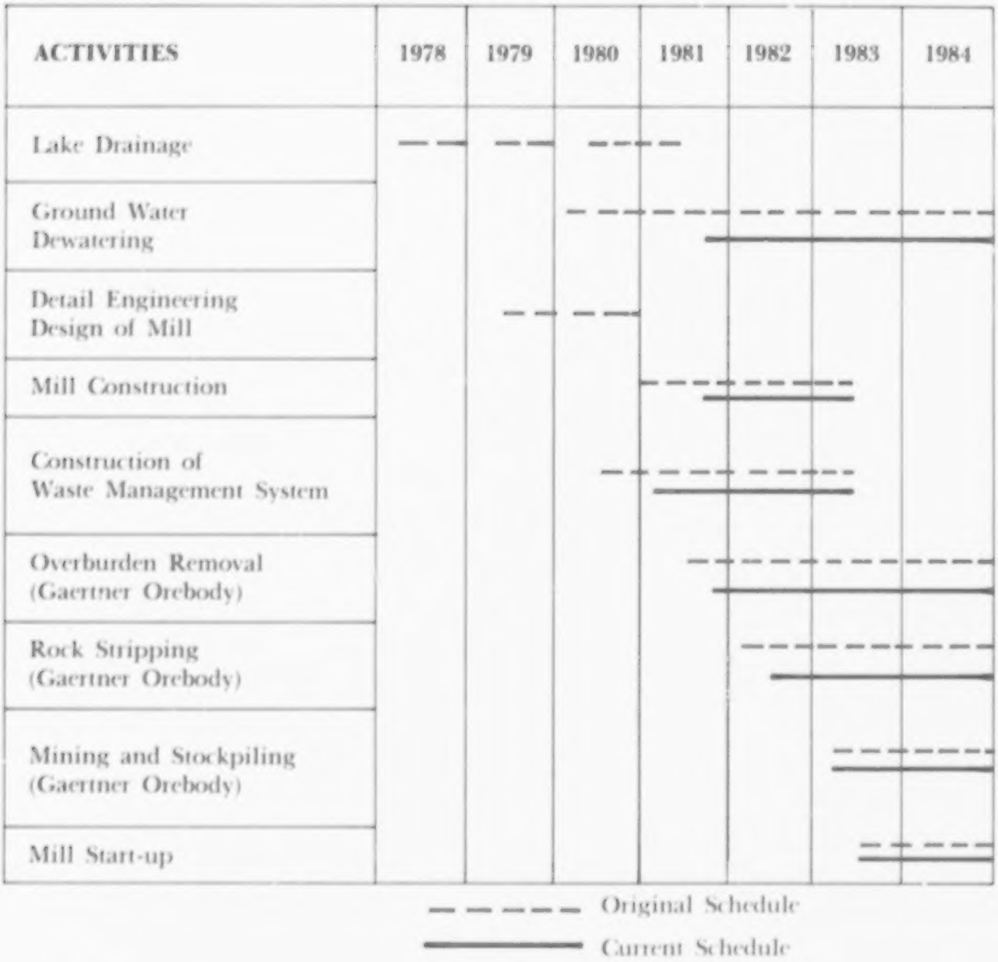

Figure 1

PROPOSED SCHEDULE OF ACTIVITIES RELATIVE TO MINING OF THE GAERTNER OREBODY AND MILL START-UP. THE CURRENT SCHEDULE IS COMPARED TO THE ORIGINAL SCHEDULE OF OCTOBER 1979

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However, contracts for overburden removal are currently under review and the actual stripping operation is expected to begin sometime in December. An estimated 7.7 million cubic meters of overburden will be removed to allow access to the entire orebody, including the cobble ore zone which overlies the main orebody. The eventual pit outline will measure about 1,000 meters long by 380 meters wide at the surface. The thickness of overburden above the cobble ore zone varies from 20 to 60 meters.

Approximately 587,000 tonnes of cobble ore is considered recoverable by present pit design. A large part of the cobble ore will be mined and stockpiled separately before the upper portion of the main orebody is accessible for mining. Mining of the main orebody will follow mining of the cobble ore and the final phase of overburden removal. If the schedule for overburden removal is maintained, mining of the main orebody could begin during the first quarter of 1983. The mining rate will average about 600 tonnes per day throughout the life of the project.

The overburden consists of unconsolidated sand and glacial debris. Rock blasting will not be necessary through the overburden. However, the ore occurs in the lower segment of unweathered and well consolidated Athabasca Sandstone and underlying metamorphic rocks. Both rock types must occasionally be drilled and blasted prior to removal. The majority of the ore will be broken up by dozers equipped with rippers. Figure 2 shows a scraper doing preparatory work on the Gaertner deposit. The unconsolidated nature of the overburden is illustrated.

Mining procedures will follow standard open pit techniques utilizing heavy duty diesel powered scrapers and/or shovels for overburden removal. Back-end dump trucks will haul all ore to the surface. All equipment utilized in the mining operation will be constructed with special shielding to protect the operators from excessive radiation in the pit. The overburden will be transported to special waste storage areas, one of which will be located immediately south of the Gaertner pit. Waste from both pits will eventually be stored at this site. Select material will be used in the construction of the mill tailings dam and storage area.

As the ore is mined and hauled to the surface, it will go directly to a primary crusher to be reduced to a uniform size. The crushed ore will then be transported to a stockpile area where it will be tested for uranium content and blended according to a desired grade for mill feed. Careful blending of the crushed ore is essential to project efficiency because of a wide variation in the uranium content throughout both ore deposits. The uranium content is known to vary from a low of 0.10 percent U_3O_8 to a high of 69.0 percent. The average feed to the mill will be maintained at 2.50 percent U_3O_8. Figure 3 shows the layout of the Key Lake project. Note the relationship of the support facilities to the two pits.

Overburden removal from the Deilmann orebody could begin by late 1984 or early 1985. The mining of ore may not begin until 1989 or 1990. The dewatering and stripping of overburden, in addition to general mining procedures, will duplicate the Gaertner project. The long duration of the Deilmann development schedule is based on the fact that an estimated 21 million cubic meters of overburden—almost three times the volume to be removed from the Gaertner orebody—must be removed. Most overburden material will be stored on a select site adjacent to but slightly northeast of the pit area. Surface dimensions of the pit will measure approximately 1,270 meters by 650 meters. The average depth to ore will be 180 meters.

The ore reserves for each deposit were calculated according to the results of a three-dimensional geostatistical computer model prepared by KLMC as part of the total feasibility study. The following tabulation is an estimate of minable reserves for each ore deposit:

Table 9

MINABLE RESERVES OF THE GAERTNER AND DEILMANN DEPOSITS

	Thousands of Tonnes Ore	**Percent Grade**	**Millions of Pounds U_3O_8**
Gaertner:			
Main Zone	814	3.30	59.2
Cobble Zone	587	0.54	7.0
Deilmann	2,117	2.49	116.2
Total	3,518		182.4

The above represents an in-place estimate of ore reserves, all of which may not be recoverable. Thus, KLMC has estimated that actual U_3O_8 recovery could

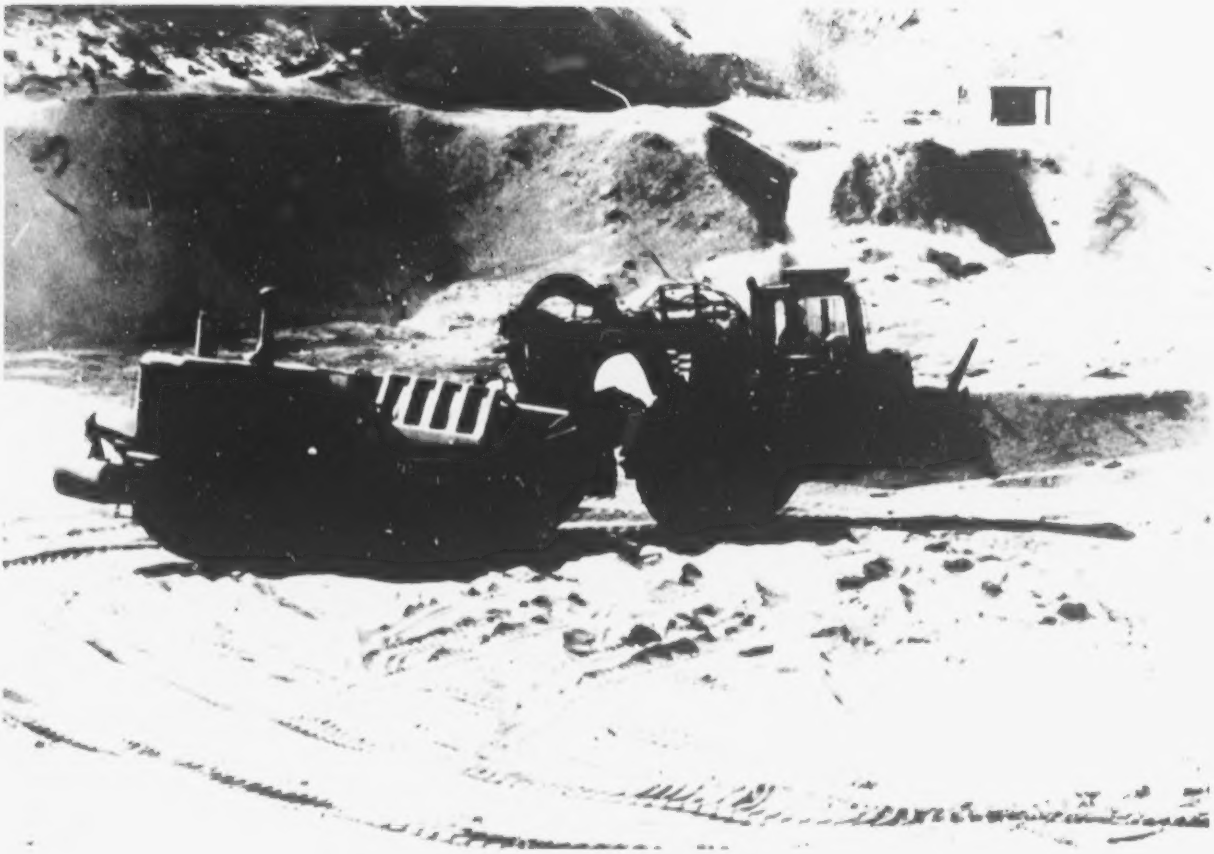

Figure 2

SCRAPER DOING PREPARATORY WORK
ON THE GAERTNER DEPOSIT

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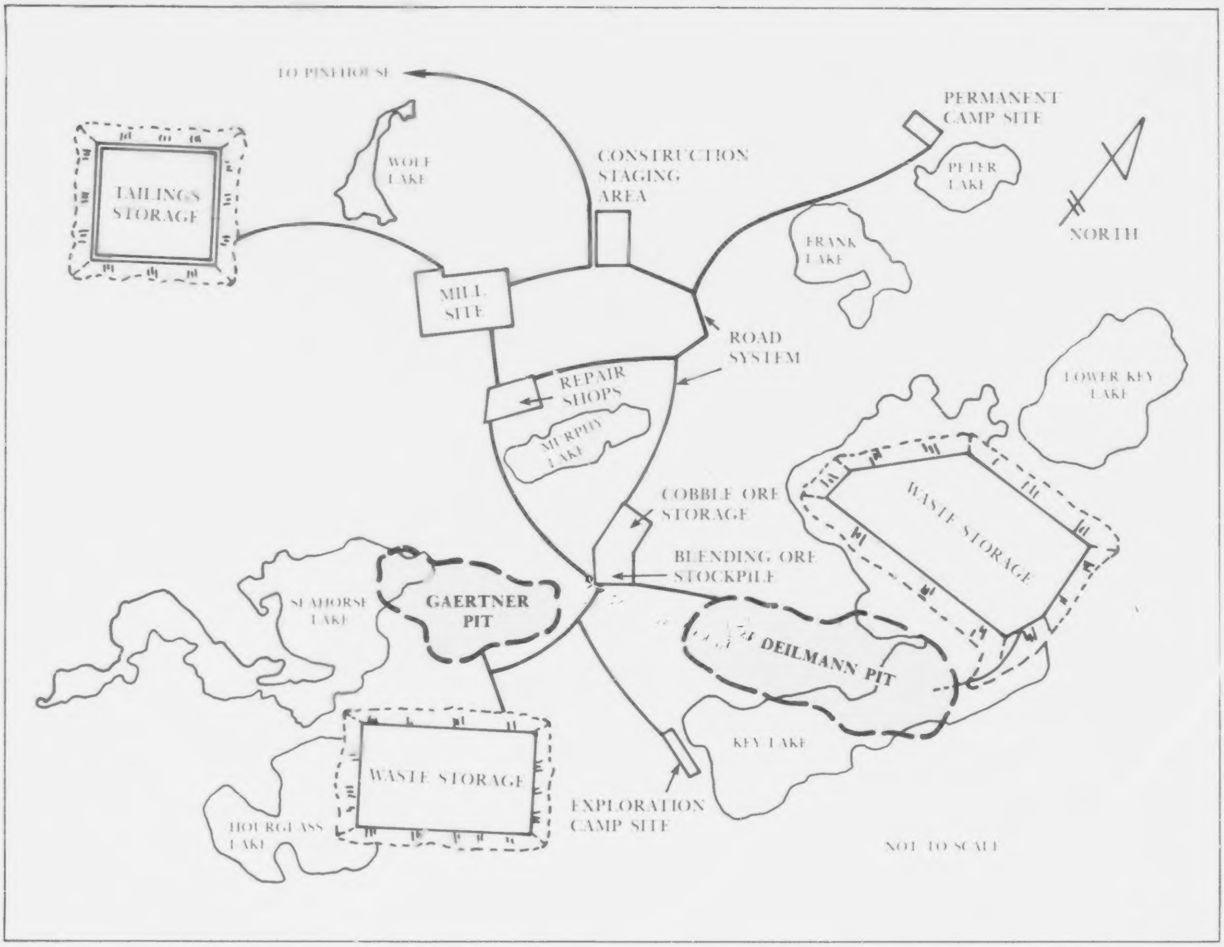
TO PINEHOUSE
TAILINGS STORAGE
WOLF LAKE
CONSTRUCTION STAGING AREA
PERMANENT CAMP SITE
PETER LAKE
FRANK LAKE
NORTH
MILL SITE
ROAD SYSTEM
REPAIR SHOPS
MURPHY LAKE
LOWER KEY LAKE
WASTE STORAGE
COBBLE ORE STORAGE
BLENDING ORE STOCKPILE
SEAHORSE LAKE
GAERTNER PIT
DEILMANN PIT
KEY LAKE
WASTE STORAGE
EXPLORATION CAMP SITE
HOURGLASS LAKE
NOT TO SCALE

Figure 3

PLANNED LAYOUT OF THE KEY LAKE PROJECT

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vary between 160 and 180 million pounds over the planned production period.

Milling

The milling process will consist of conventional mild-acid leaching, counter current decantation, solvent extraction and ammonia precipitation. Mill design capacity will be 600 tonnes of ore per day to produce up to 12 million pounds U_3O_8 per year. To accomplish the high production rate, uranium recovery efficiency through the mill will be at least 97 percent; the grade of the mill feed will be controlled at 2.50 percent U_3O_8.

Nickel and arsenic minerals associated with the uranium will not be recovered. Each mineral will be delivered to the mill tailings area as part of the main tailings stream. The nickel will not be recovered because it is contaminated with radium; there is no market for the arsenic.

Selection of the mill tailings disposal area was one of the most important considerations of the entire project. The area was situated in order to take advantage of topography and soil conditions so that the environment would be fully protected during the life of the project and post operational years as well. Eventually, tailings from the mill will be deposited in two storage sites located one kilometer northwest of the mill site, each carefully prepared with an impervious base of compact till and bentonite (see Figure 3). The entire tailings area will be situated above the natural water table. The tailings slurry will be allowed to build up in successive layers ten centimeters thick. Natural settling and evaporation of moisture will cause consolidation of each layer as it is deposited. The layers will in turn become almost completely impermeable to seal off the lower portions. At the termination of the project, each tailings site will be covered with a final impermeable seal, followed by a layer of soil which will be revegetated. The design and siting of the storage areas provides for total containment of solid and liquid waste material generated by the mining and milling project.

Work Schedule

The remote location of the project area has created other problems relative to a full scale development program. Due to the lack of a readily available labor force, it was necessary for KLMC to generate employment from six native villages in the district and the cities of Prince Albert and Saskatoon. (Much of the Rabbit Lake and Cluff Lake labor force comes from the same general area. On occasion the operating companies will be competing for employees.) Employees will be airlifted to and from the project site by charter aircraft. In each case, twin engine aircraft will be utilized because existing landing strips are unpaved.

An all weather road has been extended from the village of Pinehouse to the site, a distance of 227 kilometers. The road was first opened to traffic in August, 1980. It has served as a supply route since then, eliminating the necessity to use a special winter road which was available only from January through March. The new road was opened to the public this past summer.

The present labor force at Key Lake numbers 250 on construction and 50 on final orebody interpretation and planning. Over half of the current construction force are natives of northern Saskatchewan. The work force will increase to about 1,000 during the peak of construction activity. When mine and mill production begins in 1983, the permanent work force will total about 450 of which at least 50 percent will be natives.

The work schedule is seven days on, seven days off with 11 hours per day on the job. Work crews are rotated and flown to and from the site accordingly. Living accommodations for each employee are available on the site (Figure 3 shows the location of the camp). The current work schedule is expected to continue throughout the life of the project.

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STATISTICAL DATA

EXCHANGE VALUE $23.50/lb. U_3O_8 Determined as of October 31, 1981

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:
A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

TRANSACTION VALUE Determined as of October 31, 1981			
$/lb U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
24.10	2.1	10	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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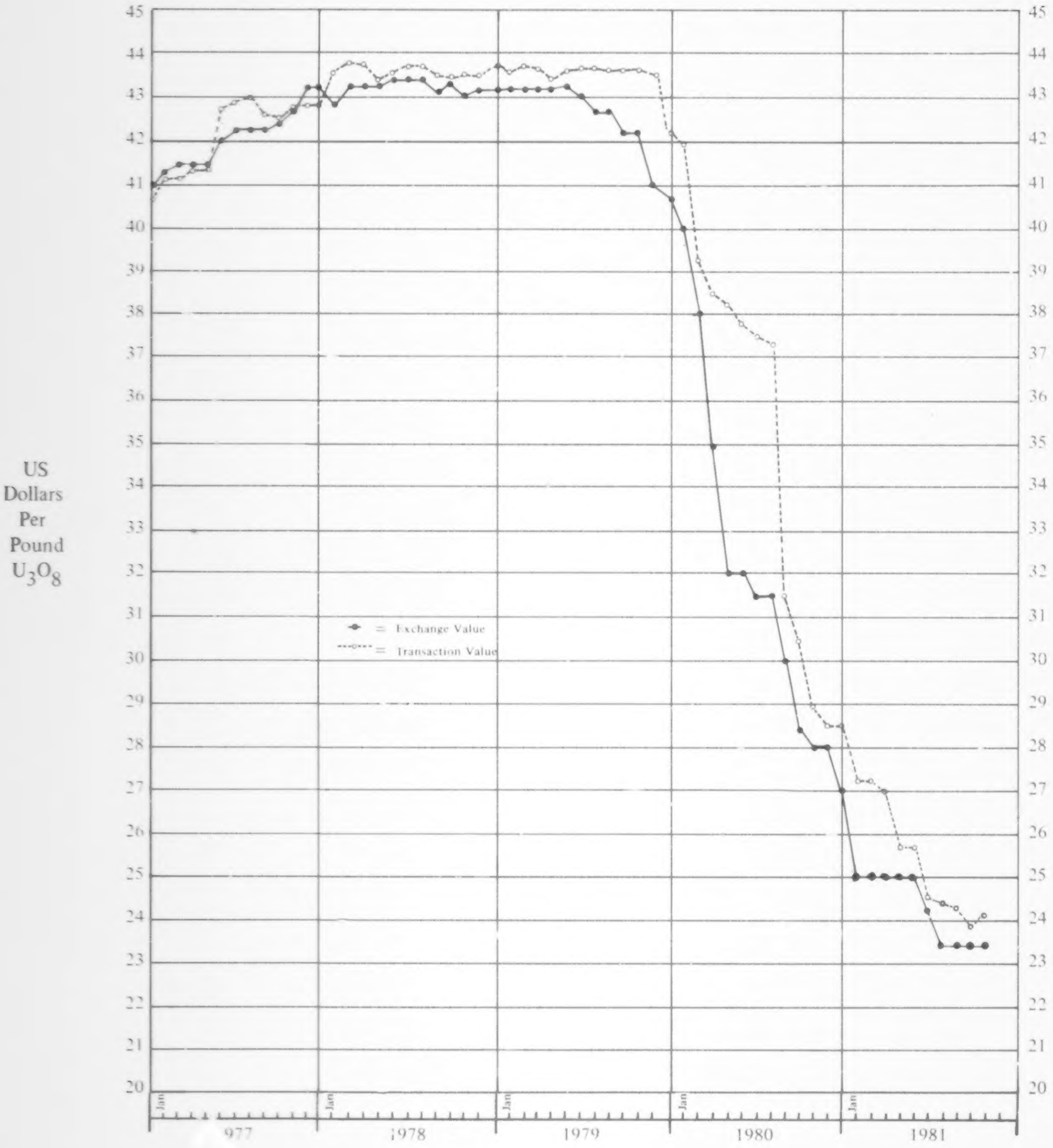
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES
SINCE JANUARY 1977

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	–	–	–	–	–	–	–	6.35	6.35	6.40	6.45	6.50
1969	–	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50		

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	–	–	–	–	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10		

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES*

Country	per lb U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	23.50	51.81	61.09
France (franc)	133.45	294.20	346.93
FRG (mark)	53.12	117.11	138.10
Japan (yen)	5,505	12,136	14,311
Switzerland (franc)	43.48	95.85	113.03
UK (pound)	12.74	28.10	33.13
Australia (dollar)	20.71	45.67	53.85
Canada (dollar)	28.30	62.39	73.57
Niger, Gabon (CFA)	6,672	14,710	17,347
South Africa (rand)	22.64	49.91	58.86
Sweden (kröner)	130.77	288.31	339.98

*Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.10/lb. U as UF_6
Determined as of October 31, 1981

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.

B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE 6%
Determined as of October 31, 1981

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.

B. Rates included in firm proposals to borrow or lend.

C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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STATISTICAL DATA

CURRENT TRANSACTIONS*

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as percent of Current E.V.	Seller Group	Buyer Group	Remarks
1606	1983-84	301-600	94	US	US	
1617	1981	301-600	97	US	Non-US	
1623	1982	101-300	115	US	US	
1637	1981	Less than 50	98	US	US	
1638	1982	301-600	104	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as percent of Current C.V.	Seller Group	Buyer Group	Remarks
none reported						

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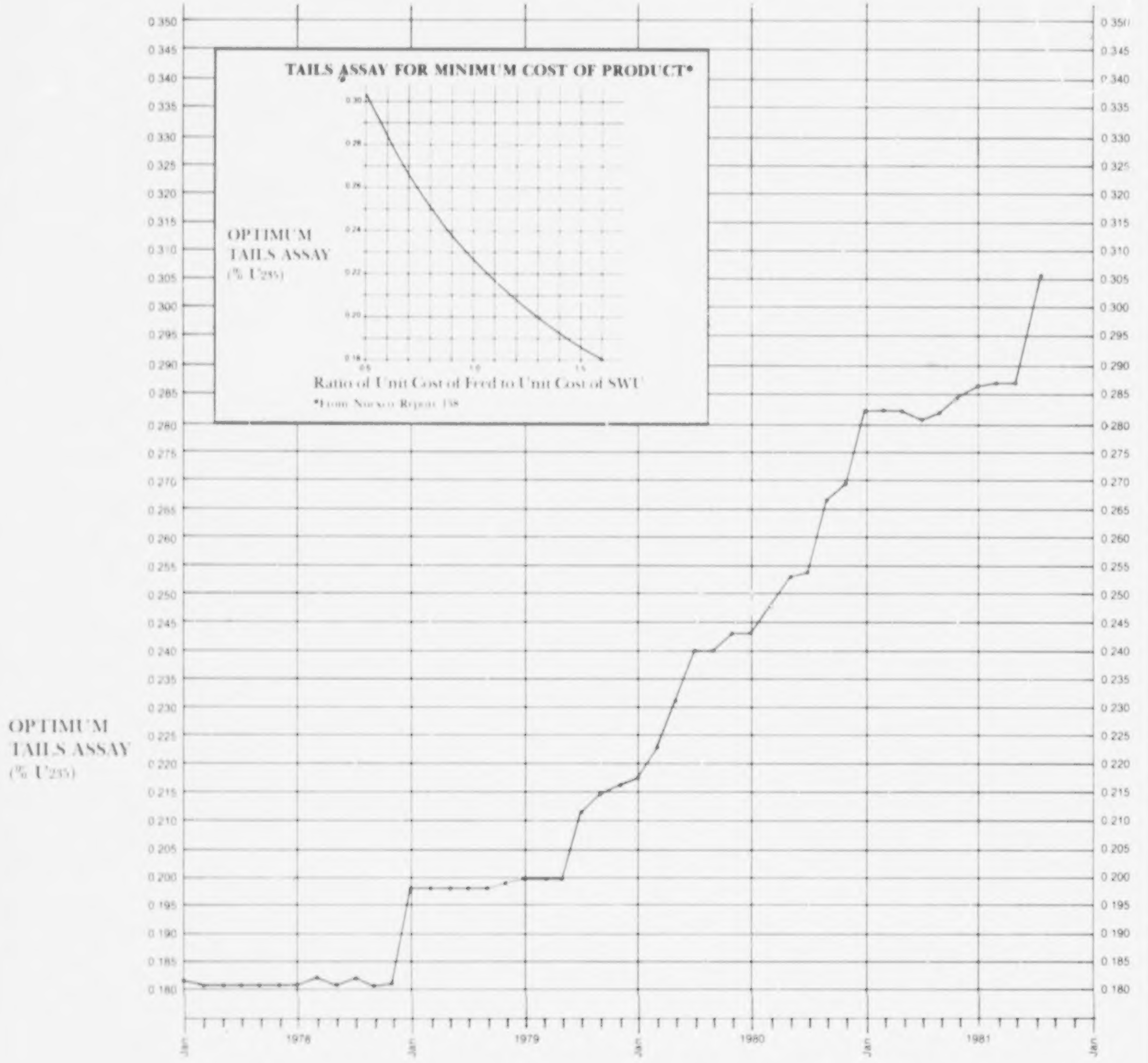
*Transactions listed include not only those *in which* Nuexco *was involved*, but also all others of which Nuexco is aware

OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1970[5]	110.0	110.4	116.3	91.36	3.88	3.87	3.69	3.28
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Jun 1980	273.5	265.6	247.6	178.93	10.14	10.70	8.25	6.86
Jul 1980	276.2	270.4	247.8	—	10.24	10.83	8.36	6.95
Aug 1980	278.2	273.8	249.4	—	10.39	10.79	8.40	7.01
Sep 1980	278.8	274.6	251.7	182.92	10.55	10.95	8.47	7.12
Oct 1980	282.2	277.8	253.9	—	10.59	11.01	8.53	7.18
Nov 1980	283.4	279.1	256.2	—	10.73	11.07	8.60	7.27
Dec 1980	286.6	280.8	258.4	183.98	10.84	11.32	8.69	7.38
Jan 1981	291.5	284.8	260.5	—	10.91	11.31	8.74	7.41
Feb 1981	295.7	287.6	263.2	—	11.15	11.36	8.80	7.43
Mar 1981	299.6	290.3	265.1	188.14	11.13	11.50	8.84	7.47
Apr 1981	303.5	293.4	266.8	—	11.30	11.63	8.94	7.51
May 1981	304.1	293.7	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	304.7	294.1R	271.3	191.06R	11.31	11.88	9.07	7.60
Jul 1981	306.0	296.0	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.0P	296.2P	276.5	—	11.83P	12.13P	9.17P	7.76P
Sep 1981	307.2P	295.5P	279.3	195.40P	—	—	9.34P	7.83P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis National Income and Wealth Division: "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1970[3]	101.4	59.88
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	217.96
Jun 1980	338.8	214.16
Jul 1980	347.8	221.52R
Aug 1980	352.0	220.08
Sep 1980	350.3	219.60
Oct 1980	348.2	221.13
Nov 1980	350.4	221.50R
Dec 1980	351.7	221.81
Jan 1981	357.8	229.97R
Feb 1981	356.6	229.79
Mar 1981	355.2	229.04R
Apr 1981	354.6	228.76R
May 1981	353.4	236.67
Jun 1981	360.4	236.99R
Jul 1981	357.5P	236.85
Aug 1981	360.2P	236.85P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1,2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3,4]		
		Metal Mining, including milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Jun 1980	243.7	10.51	8.07	8.46
Jul 1980	246.3	10.49	8.11	8.55
Aug 1980	249.4	10.58	8.14	8.65
Sep 1980	252.0	10.85	8.24	8.71
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.8	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3	11.27	8.51	8.90
Feb 1981	263.7R	11.43	8.59	9.00
Mar 1981	265.5R	11.47	8.63	9.17
Apr 1981	267.8R	11.73	8.76	9.33
May 1981	269.8R	11.80	8.90	9.49
Jun 1981	272.0R	11.80P	9.20P	9.60P
Jul 1981	273.8	11.89P	9.19P	9.64P
Aug 1981	275.2P	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1970[3]	7.34	100.3[4]	—	655,346	399,164
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	161.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Jun 1980	34.48	174.6	189.0	714,379	183,739
Jul 1980	—	177.2	192.7	715,460	202,403
Aug 1980	—	179.2	196.8	716,486	206,514
Sep 1980	36.19	182.8	199.8	710,889	204,761
Oct 1980	—	186.3	203.1	720,246	204,602
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	—	—

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[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8)			Remarks
	0 to 1 Year	1 to 2 Years	2 to 3 Years	
Available for Sale:				
1475	1000			UF_6
1480	200	300	300	
1490	1000			
1575			500	Long Term
1589	350			
1581	100	150	150	Long Term
1600			200	Long Term
1610	300	100		
1637	500	500		
1678		275		
1684	500			UF_6
1698	30			
1727	500			
1738	750			UF_6
1741	500			
1743	100	100	100	Long Term
1749	350	200	200	
1770	500			
1774	50			
1804	550			
1807	700			
1810	750			
TOTAL:	8730	1625	1450	
Available for Loan:				
1429	300			UF_6
1695	225	325	325	UF_6
1742	500			
TOTAL:	1025	325	325	

***Measured from the date of this Report.**

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Inquiries to Purchase:				
1459			200	Long Term
1462			100	Long Term
1603		100	100	Long Term
1634		400		
1699	950	300	250	
1704		200	200	Long Term
1717	200			
1724	600	500	500	Long Term
1732	50			
1744	1000			
1762	300			
1769	125			UF_6
1771	500			
1775	20			
1802	100	100	100	
1806	500	500	250	
TOTAL:	4345	2100	1700	
Inquiries to Borrow:				
1621	300			
1780	500			
TOTAL:	800			

*Measured from the date of this Report.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6)			Remarks
	0 to 1 Year	1 to 2 Years	2 to 3 Years	
1451	75			
1584	350	300	300	Long Term
1607	1000			
1609	500	1500	1000	Long Term
1619		200	100	
1661		200	200	Long Term
1684	450			
1764	100			
TOTAL:	2475	2200	1600	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6)			Remarks
	0 to 1 Year	1 to 2 Years	2 to 3 Years	
1594		400	950	Long Term
1622	200	300	300	Long Term
1776			200	Long Term
1779	200			
TOTAL:	400	700	1450	

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*Measured from the date of this Report.

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EXECUTIVE SUMMARY & INDUSTRY OVERVIEW
NUEXCO REPORT 159

Exchange Value $23.50, Unchanged

The market was relatively active during October. **Exchange Value** remained at $23.50 per pound U_3O_8 for the fourth consecutive month. Five transactions are reported involving about 1.8 million pounds U_3O_8; all had US sellers.

Unstable Equilibrium

The near term market is firming on both the supply and demand sides. However, prices could move suddenly in either direction with aggressive buying or selling decisions. Utilities are offering about 60 percent of the 8.7 million pounds U_3O_8 available for sale as listed in the *Market Opportunities* section. The total of demand listed is about 4.3 million pounds U_3O_8, about two-thirds of which is being sought by producers.

Transaction Value Increases to $24.10

The **Transaction Value** increased to $24.10 per pound U_3O_8 from $23.90 the previous month largely on the strength of two fixed price contracts for 1982 delivery.

Conversion Value $1.10, Unchanged

The **Conversion Value** remained at $1.10 per pound U for the third consecutive month. Although additional secondary market conversion buyers have emerged, available conversion continues to outweigh demand by a significant margin.

Ontario Hydro Revises Agreements; Key Lake Highlighted

In Canada, Ontario Hydro announced that it will reduce the amount of material it takes annually under long term contracts from Denison Mines Ltd. and Rio Algom Ltd. Deliveries will be extended over a longer period.

The orebody development and mining process of the Key Lake project are covered in the *Raw Materials* essay.

Europeans Review National Energy Programs

The role of nuclear power in the energy programs of Italy, The Netherlands and France have recently been the subject of government discussions. A much publicized National Assembly debate in France resulted in approval of the Socialist government's energy policy.

In Switzerland, the Federal Council reversed its previous neutral position and agreed to issue a permit for the Kaiseraugst nuclear plant. The decision must be ratified by the Swiss Parliament and a long debate period is expected.

US SWU Prices Increase

As of October 1, 1981, the US DOE is raising its prices for separative work under all three types of enrichment contracts. The effect of the increases on optimum tails calculations is assessed.

AFC Forecasts Revised

The revised Nuexco forecast of Apparent Future Consumption as of October 31, 1981 differs only slightly from that presented one year ago. The forecast and the resulting Supply and Demand Balance is analyzed in this month's Report.

Exchange Value Analyzed

This month's *Essay* attempts to clarify what the Exchange Value is and what it is not.

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B6500-1

NUEXCO

DECEMBER 1981 NUMBER 160

Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

December 1981 No. 160

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FOREWORD

Copies of the monthly chronicle of the Exchange Value, which was mentioned in last month's Report, are now available upon request. We apologize for the delay in printing.

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URANIUM MARKET

PRICING

The **Exchange Value** as of November 30, 1981 is $23.50 per pound U_3O_8. Although the Exchange Value has been $23.50 for five consecutive months, the current price level is significantly firmer than it was three to four months ago. Sellers are generally unwilling to undercut Exchange Value to enhance their prospects for making a sale.

The market remained active during November; while sellers actively competed for sales opportunities, they showed increased resistance to offer at current Exchange Value for future delivery, even just a few months away. In response to buyers' inquiries, Nuexco encountered only one offer for near term delivery at a price below Exchange Value. This trend can be seen as a function of both a strengthened demand sector and the lowering of interest rates which relieves some of the pressure of inventory carrying costs.

The near term market is firming both on the supply side and the demand side. The total of material available for sale, as indicated in the *Market Opportunities* section of this Report, is about 7.1 million pounds U_3O_8. About two-thirds of this material is being offered for sale by utilities.

The total of demand in the near term market is about three million pounds U_3O_8. A little more than half of the material is being sought by producers.

The **Transaction Value** remained at $21.10 for the second consecutive month. Ten transactions totaling 2.1 million pounds U_3O_8 are included in this month's calculation. The **Loan Use Charge Rate** remained at six percent.

The **Conversion Value** rose ten cents to $1.20 per pound U as UF_6. The secondary market for conversion services experienced little activity during November. Sellers were hesitant to make offers at or near $1.10 per pound U, particularly if delivery would not have been immediate. On the demand side, buyers gave some indications that they might be willing to pay slightly more than $1.10 per pound U for delivery within one year. There is also some evidence that conversion services, when priced as a component of a UF_6 sale, may be priced lower than when they are sold independently.

As indicated in the *Market Opportunities* section of this Report, the amount of secondary market conversion services available for delivery in the near term (within one year) increased slightly to approximately 2.6 million pounds U as UF_6. This available supply now outweighs demand by more than 13 to one in the near term. However, the potential sellers, for the most part, are not driven by any immediate need to "deconvert" their UF_6 inventories to respond to U_3O_8 inquiries and, thus, do not need to lower their prices in order to compete for the limited opportunities to sell conversion services.

There is one transaction reported this month. A US producer sold between 50,000 and 100,000 pounds U_3O_8 to another US producer with delivery to occur in 1981.

AFRICA

South Africa's Electricity Supply Commission (ESCOM) recently announced that it had obtained sufficient enriched product for the first core of Koeberg unit 1. There is disagreement over the source of the enrichment, and ESCOM has denied that it came from France, the United States or South Africa itself. ESCOM's reluctance to discuss the transaction is understandable in view of the sensitive political and nonproliferation considerations associated with this matter. The enriched product will be fabricated into finished fuel by Framatome in accordance with its existing agreement with ESCOM.

In Report 159, Nuexco commented that the South Africans seemed confident about their ability to obtain necessary enrichment supplies in spite of safeguards problems. This recent announcement suggests that their confidence was well founded.

AUSTRALIA

Mary Kathleen Uranium Ltd. (MKU) can start clearing its $20 million backlog of uranium shipments after winning an injunction against the Seamen's Union in Australian Federal Court on November 6. MKU had not shipped any of its uranium production since June this year because of union bans. With the injunction, shipping companies will again be willing to load uranium because the union is legally prevented from enforcing its ban. MKU guaranteed in court that it would not seek damages against the union.

In a recent parliamentary inquiry report, members of the Select Committee of the Legislative Council in South Australia have recommended that the State's uranium resources be developed. However, three of the six-member committee (two Australia Labor Party members and one Democrat) have dissented from the

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report and opposed uranium mining in the State. This tied vote clouds the future of the Olympic Dam copper-uranium development. The Australian Democrat holds the balance of power in the State Parliament and his vote will be crucial when the indenture agreement bill is introduced into the House before the end of the year. Western Mining Corp. Ltd. (WMC), the developer of the Olympic Dam deposit, indicated that the deposit could not be mined unless uranium was produced together with copper and gold. WMC has recently awarded the contract for the final feasibility study of its Yeelirrie development to the same firm which engineered and managed the Nabarlek uranium project for Queensland Mines Ltd.

No uranium deliveries will be made to Japan under contracts signed after 1972 until a nuclear-safeguards agreement has been negotiated, according to the Minister for Foreign Affairs.

The Ranger mine and mill was officially opened on November 20. However, three days later, it was shut down by the local Northern Territory (N.T.) government because the tailings pond did not conform to regulatory requirements. According to the local authorities, solid material in the filled pond had been evident above the water level. Regulations require that solid waste remain two meters below the surface.

The mine and mill were given permission to reopen after a few days by Ian Tuxworth, the N.T. Minister for Mines and Energy, and production is continuing. The shutdown illustrates strict implementation of the environmental regulations by the local authorities. The Ranger incident is the second of this type in the territory and will aid the case of those opposing uranium development there, and also might harden union attitudes against uranium mining and exportation. The situation could have a negative impact on uranium activities on the whole and on aboriginal negotiations presently underway between Pancontinental and the Northern Land Council.

CANADA

On December 3, Eldorado Nuclear Ltd. announced that it is closing its Beaverlodge facility after 30 years of operation. The closing will be effective June 30, 1982. Eldorado cited the fact that Beaverlodge production is no longer economic as the reason for the move. The mine and mill will be decommissioned after shutdown. Eldorado will not have a problem honoring its existing contracts for uranium delivery because of its ownership of the Canadian stockpile.

EUROPE

The fate of Framatome, which is owned 66 percent by Creusot Loire, 30 percent by CEA and four percent by the Empain Schneider Group companies, appears finally to have been decided. The French nuclear reactor manufacturer will not be nationalized or merged with Creusot Loire as previously considered. Instead, it will become a three-way partnership. The other partners will be its two largest shareholders, Creusot Loire and the CEA.

All important decisions within the partnership will require unanimous approval, so the structure will give the CEA a veto power it did not have previously. The French government did not allow the merger of Creusot Loire and Framatome because it did not want the state to be involved in the other activities of the Creusot Loire group. A merger also would have left Framatome vulnerable to the financial difficulties of Creusot Loire. CEA is expected to raise its Framatome shareholding to 34 percent in order to have a blocking minority.

Framatome and Novatome (the company constructing the fast breeder Super Phenix) may merge within the next two years. Framatome now holds 85 percent of Novatome; Alsthom Atlantique holds the remaining 15 percent.

Newspapers in **France** are reporting that it is almost certain that Egypt's first two reactors will be awarded to the French. The papers add that American sources believe the reasons are political and that the sales are tied to French arms contracts.

The first criticality of the Grafenrheinfeld 1300 MWe PWR unit in **West Germany** was delayed in order to make some changes to the feed water system piping. Criticality is again expected to be achieved very shortly. The plant received its license to proceed to power operations on November 13, 1981, subject to successful completion of the proper start up testing.

FAR EAST

From time to time, there has been speculation that **Japan** might, under government auspices, initiate a program to build up its uranium inventories through large scale purchases in the spot market. For the most part, such speculation appears to be wishful thinking

URANIUM MARKET

on the part of uranium sellers seeking enlarged markets for excess material. These sellers enthusiastically supplied the Japanese with a rationale for such a stockpiling program, namely enhanced security of supply. Often overlooked is the fact that, in Japan, only a stockpile of enriched product provides real supply security, since a U_3O_8 stockpile must eventually be exported for conversion and enrichment. US sellers provided the additional rationale that Japanese purchases of US origin U_3O_8 would help reduce the recurrent balance of payments problems between the two countries.

Japan's Natural Resources and Energy Agency recently reviewed the uranium situation with the Japanese utility companies. They concluded that the size of the existing inventories and future deliveries under contract were such that it would be difficult to justify increased stockpiling at this time.

SOUTH AMERICA

Approximately 80 percent of the total 1,142,000 square kilometer land base of **Colombia** has been reserved for uranium exploration and evaluation activity under the direction of the Instituto de Asuntos Nucleares (IAN). The remaining 20 percent of the land base could become available for exploration activity following staking of mining claims in accordance with the general mining laws of Colombia.

Uranium reconnaissance in the country has been conducted intermittently since 1949 through the National Geological Survey and IAN. More recently, exploration activities have increased through both independent projects performed by IAN and IAN's ongoing joint venture programs with Agip-Nucleare of Italy, Minatome and Cogema of France, and ENUSA of Spain. These projects have primarily consisted of aerial radiometric and geochemical reconnaissance. Test drilling has been completed in certain areas. Approximately 272,000 square kilometers are covered in the recent programs. Exploration expenditures exceeded US twelve million dollars during the 1980-1981 period. Exploration results have been encouraging to both IAN and the joint venture participants, confirming plans for increased exploration efforts.

UNITED STATES

Distribution of US Uranium Inventories

The US Department of Energy (DOE) recently conducted a survey of the uranium industry[1] to update its data on uranium inventories held by producers and electric utilities. These inventories, when combined with the DOE uranium inventory, constitute the total national uranium inventory. As of the beginning of this year, the US inventory consisted of 312 million pounds U_3O_8 equivalent, divided into three principal groups as shown in Table 1.

The inventory position shown in Table 1 contrasts sharply with that which the electric utilities and DOE would like to maintain, shown in Table 2.

Table 1

US URANIUM INVENTORY POSITION AS OF JANUARY 1, 1981
(millions of pounds U_3O_8 equivalent)

Producers	5.4
Electric Utilities	142.4
US DOE	163.8
Total	311.6

Table 2

DESIRED US URANIUM INVENTORY POSITION
(millions of pounds U_3O_8 equivalent)

Producers	5
Electric Utilities	35
US DOE	100
Total	140

A recent survey by Nuexco indicates that most utilities have policies or guidelines to maintain a uranium inventory (excluding material-in-process to meet schedule requirements for the next reactor reload) of about one year's requirements. The actual number varies from about six months to 18 months. A few utilities have guidelines to maintain essentially no inventory; a few other utilities have guidelines to hold inventories in excess of 18 months.

About 60 percent of the electric utilities hold inventories in the range of zero to 24 months. The other 40 percent, in the large part, have been victims of circumstances difficult to control. Early contracting

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[1] "U.S. Uranium Market Developments", S.V. Krusiewski and D.C. Thomas, Department of Energy, October 1981

URANIUM MARKET

for U_3O_8 to meet requirements for nuclear power plants ordered in the 1972-1974 "boom" years, and subsequently delayed or cancelled, resulted in many utilities now carrying excess inventories.

The industry is improving its uranium inventory position, but as shown in the US supply-demand tables in the November 1981 Monthly Report (Report 159, Table 7, page 15), it could take approximately ten years for US utilities to improve their collective position from 5.5 years of forward consumption to 1.8 years of forward consumption. This is still short of their collective desire to hold an average inventory of one year's forward consumption. The 1981 Beginning Inventory position of 147.8 million pounds U_3O_8 equivalent represents only the *commercial*—producers and electric utilities—inventories and excludes the government inventories since they are not readily accessible for commercial use.

The Nuexco survey also showed that electric utilities strongly prefer to hold their inventories as U_3O_8. This desire has been difficult to fulfill for most utilities. Again, early contracts for conversion and, to a lesser extent, for enrichment, have forced utilities to upgrade much of their U_3O_8 to natural or enriched UF_6. Table 3 shows that 40 percent of the utility inventory is in the form of natural UF_6 and 30 percent is in the form of enriched UF_6.

The US government's inventory of approximately 164 million pounds U_3O_8 equivalent includes about 100 million pounds U_3O_8 equivalent allocated to working inventory at the DOE enrichment plants and to strategic inventories. The remaining 64 million pounds will be utilized over the next 15 years to meet the long-term requirements of government programs.

The government has no plans to sell or otherwise dispose of its uranium inventories on the commercial market. The government does maintain a policy of leasing (preferably) or selling uranium to commercial users under emergency conditions, that is when uranium is unavailable from commercial sources. This policy has never been implemented for substantial quantities of uranium. The government has sold material to small users who have encountered difficulty acquiring small quantities on the market; this is merely a convenience and has had no significant effect upon the government inventory position or the commercial market.

Lastly, the producer inventory is of little consequence. Producers deliver material to the converters in advance of title transfer to utilities; this action principally occurs from the producers' desire to operate his mill at a uniform production level. These inventories have a high turnover rate, and represent a small fraction of the total.

A detailed breakdown of the total US uranium inventory position is given in Table 3, with material shown in different forms as either material in storage, feed material, product material or in process of conversion to a different form.

Table 3

TOTAL URANIUM INVENTORIES HELD IN THE US AS OF JANUARY 1, 1981
(millions of pounds U_3O_8 equivalent)

As Uranium Concentrates (U_3O_8)	
Producers	
Stocks stored at convertors	5.4
Electric Utilities	
Stocks stored at convertors	42.9[1]
Subtotal: Uranium as U_3O_8	48.3
As Natural Uranium Hexafluoride (UF_6)	
Electric Utilities	
Stocks stored at convertors	36.5[1]
Stocks stored at DOE under usage agreements	10.8
Feed delivered under DOE enrichment agreements	9.4
United States Government	
Stocks stored at enrichment plants	41.0
Subtotal: Natural Uranium as UF_6	97.7
As Enriched Uranium Hexafluoride (UF_6)	
Electric Utilities	
Stocks awaiting delivery at enrichment plants	6.2
Stocks stored at fabricators	36.6
United States Government	
Working and strategic stocks at enrichment plants	122.8
Subtotal: Enriched Uranium as UF_6	165.6
Total	311.6

[1] Nuexco estimate

URANIUM MARKET

The data presented in the tables above is extracted from DOE publications and supplemented by Nuexco estimates based on private information in its data base. The data has a high degree of accuracy, but does not include all or part of the following inventory categories:

1. Material *owned* by US convertors and fabricators used for working inventories in their plants; the individual inventories are small due to the large amount of material stored at these sites by the electric utilities; the convertors and fabricators utilize the utility-owned material for a substantial portion of their working inventories through special provisions in the storage agreements;
2. Material stored by electric utilities at non-domestic convertor sites, such as Eldorado Nuclear in Canada and British Nuclear Fuels Ltd. in the United Kingdom, may not be fully included.
3. Large stocks of depleted uranium from the enrichment plant operations are not included since this tailing material has little commercial nuclear fuel application (except for consumption of excess SWUs as demonstrated by ENEL, the national utility of Italy, which upgraded depleted uranium to natural uranium to meet contract obligations at the Eurodif enrichment plant).

Last month's Report, number 159, incorrectly stated the operating tails assay of the DOE enrichment complex. Although the operating tails assay was correctly stated elsewhere in the article, the subject is important enough to justify correcting the error. In Report 159, on page 9, left hand column, fourteenth line from the top, the operating tails assay should read "0.20 percent U_3O_8," not 0.25 percent.

On October 1, 1978, DOE reduced its operating tails assay from 0.25 percent U_{235} to 0.20 percent U_{235}. That action ended seven years of so-called split-tails operations. Under the split tails policy, DOE operated the enrichment plants at a higher tails assay than that used for enrichment transactions.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Periods* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Available for Sale:				
1475	1000			UF_6
1480	100	300	300	
1490	1000			
1575			500	Long Term
1589	50	50	50	Long Term
1581	100	150	150	Long Term
1600	250	250	250	Long Term
1610		300		
1637	500	500		
1684	500			UF_6
1698	30			
1738	750			UF_6
1749	350	200	200	
1770	350			
1774	50			
1804	550			
1805	300	300	300	Long Term
1807	700			
1810		750		
1814	250			
1818	250	250	250	Long Term
1824	30			
TOTAL:	7110	3050	2000	
Available for Loan:				
1695	225	325	325	UF_6
1742	500			
1785	1000			
1815	1000			UF_6
TOTAL:	2725	325	325	

*Measured from the date of this Report

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Inquiries to Purchase:				
1459			200	Long Term
1603			100	Long Term
1634		400		
1699	725	450	250	
1704		200	200	Long Term
1724	650	500	500	Long Term
1732	50			
1744	1000			
1769	125			UF_6
1771	500			
1775	20			
1806		500	250	
TOTAL:	3070	2050	1500	
Inquiries to Borrow:				
1621	300			
1780	500			
1812	1000			
TOTAL:	1800			

***Measured from the date of this Report.**

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1451	75			
1584	350	300	300	Long Term
1607	1000			
1609	500	1500	1000	Long Term
1619		250	50	
1661	200			
1684	450			
1764	100			
TOTAL:	2675	2050	1350	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1594		400	950	Long Term
1622	200	300	300	Long Term
TOTAL:	200	700	1250	

*Measured from the date of this Report.

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ESSAY

THE IMPACT OF REACTOR CANCELLATIONS

The cancellations of nuclear reactors over the past several years have often been cited as a cause of the declining uranium prices during the same period. While it is difficult to accurately quantify the impact, it is possible to approximate the amount by which cumulative demand for uranium will be reduced as a result of these reactor cancellations.

Using the Nuclear News World List of Nuclear Power Plants as a benchmark, the reactors in the US cancelled between the June 1979 and June 1981 publications are itemized in Table 4. During that time, 23 reactors comprising some 25,000 MWe were cancelled. The previously anticipated commercial operating dates ranged from late 1983 to indefinitely postponed.

From this list of cancelled reactors, a rough calculation of their impact on uranium demand can be made by using the following assumptions:

1. First core demand is assumed to be one million pounds U_3O_8 per 1,000 MWe and is assumed to appear two years in advance of the expected commercial operating date. This lead time accounts for the utility advance procurement policies as well as for pipeline times through conversion, enrichment, fabrication, etc.

2. Reloads are assumed to consume approximately 322,000 pounds U_3O_8 per 1,000 MWe, and the demand

Table 4

US REACTORS CANCELLED 6/79-6/81[1]

Reactor	Utility	MWe	Expected Commercial Operating Date As of 6/79
Palo Verde 4	Arizona Nuclear Power Project	1270	5/88
Palo Verde 5	Arizona Nuclear Power Project	1270	5/90
Pilgrim 2	Boston Edison	1150	12/85
Davis Bessie 2	CAPCO Group	906	88
Davis Bessie 3	CAPCO Group	906	90
Erie 1	CAPCO Group	1260	4/86
Erie 2	CAPCO Group	1260	4/88
Greenwood 2	Detroit Edison	1200	90
Greenwood 3	Detroit Edison	1260	92
Forked River 1	General Public Utilities	1120	12/83
Jamesport 1	LILCO	1150	88
Jamesport 2	LILCO	1150	90
NEP-1	New England Power	1150	indef.
NEP-2	New England Power	1150	indef.
Tyrone 1	Northern States Power	1100	86
Montague 1	Northeast Utilities	1150	indef.
Montague 2	Northeast Utilities	1150	indef.
NYSEG-1	New York State Electric & Gas	1250	4/92
NYSEG-2	New York State Electric & Gas	1250	4/94
Bailly	NIPSCO	645	84
Sterling	Rochester Gas & Electric	1150	4/88
North Anna 4	VEPCO	938	4/87
Haven 1	Wisconsin	900	6/89
Total: 23 Reactors	14 Utilities/Utility Groups	25,675	

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[1] Units listed as on order or under construction in the June 30, 1979 Nuclear News World list of Nuclear Power Plants but not included in the same publication for June 30, 1981.

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for reloads appears eighteen months in advance of the need for the first reload and annually thereafter. In cases where a year but no month is given for the Nuclear News expected commercial operating date, the analysis assumed a startup in the second half of the year.

3. Twelve month fuel cycles are assumed.

Table 5 shows the lost demand associated with the cancellations shown in Table 4. The results for the years 1991 through 1995 are grouped into one entry. Also, two of the four 1,150 MWe reactors which were indefinitely postponed as of 1979 and cancelled as of 1981 are assumed to have had late 1993 commercial operating dates; the other two are assumed to have had late 1995 commercial operating dates.

Although this model makes some large simplifications, the result is nonetheless staggering. In the last two years, reactor cancellations have eliminated more than 80 million pounds of U_3O_8 demand over the next 15 years.

In addition to the cancellations already announced by various utilities, Nuexco believes that there will be additional utility decisions to cancel at least fourteen reactors due to financial and political considerations. Table 6 summarizes Nuexco's estimate of the amount of generating capacity and the accompanying loss of demand represented by these probable future cancellations, using the same procurement assumptions that were used in Table 5. These anticipated cancellations represent an additional 60 million pounds of lost demand over the next 15 years.

Thus, between the reactors already cancelled and those which Nuexco estimates *probably* will be cancelled over the next few years, some 140 million pounds of demand will have been eliminated. That quantity represents more than five years' forward consumption for the US.

A utility with a cancelled reactor has limited options with respect to the supply associated with the reactor:

1. If there is no supply in inventory or under contract for the reactor, the utility may abandon plans to procure this uranium. Alternately, the utility may renegotiate to cancel its supply contract, if the supplier is willing. This will depress the longer term uranium price, because anticipated demand will not materialize.

2. If there is supply associated with the reactor, either in inventory or under contract, the utility may elect to use this uranium for other reactors it has

Table 5

IMPACT OF CANCELLED REACTORS 6/79-6/81

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991-1995
Cancelled GWe	0	0	1.1	.6	1.2	2.4	.9	5.7	.9	4.5	8.3
Cumulative Cancelled GWe	0	0	1.1	1.7	2.9	5.3	6.2	11.9	12.8	17.3	25.6
Lost Demand (millions of pounds U_3O_8)	1.1	0.6	1.5	2.9	2.3	6.8	4.1	8.7	4.5	8.1	41.6
Cumulative Lost Demand (millions of pounds U_3O_8)	1.1	1.7	3.2	6.1	8.4	15.2	19.3	28.0	32.5	40.6	82.2

Table 6

IMPACT OF FORECAST CANCELLATIONS*

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991-1995
Cancelled GWe	0	0	0	1.2	1.3	1.2	2.4	1.2	2.5	2.3	4.9
Cumulative Cancelled GWe	0	0	0	1.2	2.5	3.7	6.1	7.3	9.8	12.1	17.0
Lost Demand (millions of pounds U_3O_8)	0	1.2	1.3	2.0	3.6	3.1	4.5	5.5	5.9	5.2	27.9
Cumulative Lost Demand	0	1.2	2.5	4.5	8.1	11.2	15.7	21.2	27.1	32.3	60.2

*Nuexco estimates

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running. This reassignment will displace the uranium needs of the other reactor(s), which, as in (1) above, will exert downward pressure on the longer term uranium market.

3. The utility may choose to sell the material designated for the cancelled reactor because of lack of need, holding costs, or a need for cash. In this case, the sale will have a direct downward impact on the market, and particularly on the spot market.

Over the last couple of years, utility inventory sales have become more frequent. While such sales have not been the sole cause of the price decline, they have made a significant impact. However, the material being sold by utilities is but a fraction of the material affected by reactor cancellations, not to mention the impact of the many delays. In most cases, utilities holding excess are handling the material in the fashions described in points (1) and (2) above. The effect of this is more subtle and difficult to perceive than that of spot sales of inventories, but the sheer magnitude of the lost demand will inevitably exert substantial resistance against any upward price movements for some time.

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COMMENTARY

The following is a slightly edited version of a speech given by Mr. J. Robert Wolcott, President of Nuexco, on the occasion of the Nuexco luncheon at the Atomic Industrial Forum (AIF) Annual Conference in San Francisco, November 29-December 2, 1981.

DILEMMAS OF NUCLEAR POWER

Introduction

The nuclear power industry is in very difficult straits. Its problems are so deep-seated that they require a whole new conceptual approach.

A September report to the presidentially appointed Nuclear Safety Oversight Committee entitled "Governance of Nuclear Power" contains the following:

"— Over 70 nuclear power plants operating in the United States;

— Approximately 80 plants at various stages of construction;

— Two plants under construction, with combined sunk costs exceeding $300 million, cancelled in the past two years;

— More than 80 previously planned plants deferred or cancelled in the past five years;

— Five orders for new plants placed in the past seven years (compared with over 100 orders in the preceding seven years); and

— No orders for new plants placed in the past three years.

It is clear that nuclear power has reached a hiatus, and perhaps an impasse. This situation can be attributed in part to a reduction in the rate of growth of demand for electricity, to high interest rates, and to keen competition for capital in financial markets. But there are other factors operating as well, as evidenced by the fact that there have been orders for 125,000 MWe of coal-fired capacity in the past seven years, of which 24,000 MWe has been ordered in the past three years."

I chose this opportunity to talk about the need to resolve dilemmas because time has become critical. The conditions under which nuclear power works are deteriorating. The next few years might be the last chance to change course. Preserving that chance depends upon bold, realistic action.

I plan to discuss several critical dilemmas. I want to explain, too, why both the federal government and private industry must devise new concepts and recast roles.

Recommendations for Action

Actions by the Reagan Administration have been helpful, but hardly more than a bandaid. I believe this is because the present Administration emphasis is not addressing the most fundamental issues with a proper priority. Preoccupation with reprocessing and fast breeder programs is diluting attention. Fast breeder technology, for example, is of little value if the capability to build even a light water reactor is lost.

I believe Mr. Reagan should select two priority items now and promote them above all else. The two are:

1. *Waste disposal*—demonstration of whatever is needed to lessen this obstacle in the public mind.
2. *Government guarantees*—assurance to investors and users that they will not back a project only to find at some future time that the investment is worthless; or to have consumers find that a presumed solution to their electrical needs in the 1990s has evaporated.

In parallel with those government actions it is necessary that industry develop the following:

1. A concept of nuclear power operations under which utility boards of directors would *approve* and financial institutions would *invest* in nuclear projects. Merely being certain that utilities have the needed funds is not enough. Conditions have to be such that the funds will be allocated to nuclear.
2. Advice to the government of those specific conditions the government must establish and the role government must play, in order to spur private industry action.

The urgency of time requires that government and industry actions proceed in parallel.

The Major Dilemmas

I would like to summarize a number of dilemmas confronting the industry. Most, and perhaps all, urgently require resolution.

Dilemma Number One: Defining the National Interest

The relationship between advancement of nuclear power and advancement of the national interest is less clearcut than appeared to be the case a few years ago. Both coal and nuclear power appeared essential to meet the next two decades' energy needs. It was thought that neither could handle the job alone.

During the past few years, projected annual growth rates for those two decades have been declining. Forecasts of two to three percent are prevalent. Furthermore, reserve capacity has been holding steady or increasing. The national reserve is about 36 percent.

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COMMENTARY

roughly twice what is needed. We need to add only six to ten new plants each year during the next decade as we work off some of the excess capacity, if the lower growth forecast proves valid. Coal, if necessary, can meet that need.

Nuclear power has thus moved from an *essential* role to an *optional* role. An essential role has moved farther into the future. We cannot expect nuclear power to be pulled along simply by national interest near term. Coal will have its own problems in time, but does not have barriers now comparable to those of nuclear power.

Dilemma Number Two: A Separation of Authority and Responsibility

The federal government has total jurisdiction and total authority over safety. As safety has no hard boundaries, and all overriding cost influences derive from safety criteria, the real determinant of construction and operating cost is the federal government.

The federal government, however, does not share cost responsibility. That falls upon the owners and ratepayers. That division of responsibility and the ever-increasing concern with safety have saddled nuclear utilities with open-ended, financial obligations which few, if any, can afford.

With one exception, all nations which are pushing ahead with nuclear power have government owned utilities. Included are France, Korea, Taiwan and Mexico. The exception, Japan, is noted for close government and industry cooperation. Wherever private utilities prevail, and thus the split of cost responsibilities prevails, as in Sweden, Germany, Switzerland and the United States, nuclear power is stalemated.

This separation gap, I think, is such a critical factor for private utilities that nuclear power in the US will remain at an impasse until legislation provides protection from the consequences of government decisions. Authority and accountability cannot be brought together by transfer of safety authority to private industry. The only solution is to bring cost accountability to the government.

Dilemma Number Three: Utility Incentive Structures

It is never totally clear what comprises the national interest or how long a particular definition of that will survive. The definition is political and undergoes constant change. Moreover, the incentive structure—that is, the system of rewards and penalties—imposed on a particular utility may have nothing to do with interests defined at the federal level. For example, at the same time President Reagan is promoting nuclear power, Governor Brown is frustrating it in California. Fuel pass-through provisions, another example, may encourage burning oil rather than bringing in more economical, but higher capital cost nuclear. I doubt that any state or local government incentive structure favors nuclear power.

Unless incentive structures are changed, coherent national policy cannot be implemented. The federal government has little power to change an environment imposed by state and local governments. This dilemma is likely to go unresolved unless the federal government has a commanding, authoritative role as it does, for example, with the Tennessee Valley Authority (TVA). In other words, TVA is much less vulnerable to local problems than other utilities.

Incentive problems are worsened by the knowledge that a utility management can expect all problems of all types to be widely publicized. As long as media communications have negative consequences, utilities will be at odds with a significant fraction of its customers, a bad situation for any business.

Dilemma Number Four: The Decline of US Supplier Capability

The US supplier industry capability was built to supply 25 units per year. Current backlog delivery rates are less than half a dozen. Over two dozen plants have been cancelled during the past two years. A dozen more cancellations are expected in the next two. Cancelled capacity is almost as much as the total present operating capacity of all of Western Europe.

By the mid 1980s, supplier capability will reach a critical level. Major equipment manufacturing operations will have been closed. Many second tier suppliers will have withdrawn from the nuclear industry.

A supplier cannot exist indefinitely on a negative order rate regardless of the national interest. Consolidation is unavoidable even assuming the most favorable outlook possible. Probably no more than one supplier can be maintained based on the predicted orders for the next ten to 15 years.

Delimma Number Five: Mismatches Between Energy Cycles and Political Cycles

A nuclear plant ordered today would not supply electricity until 1995. The political cycle is far shorter.

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COMMENTARY

A politician's first need is to get elected. His second need is to get reelected. Those needs occur at intervals of only a few years. Chances for remaining in office are usually enhanced more by decisions producing demonstrable short term benefits than by promotion of the general welfare recognizable 15 years hence.

During design, construction and operation, a utility will face numerous changes in governments. Policies change as governments change. We cannot lengthen government cycles sufficiently to match nuclear project cycles. We cannot shorten project and operating cycles to match political cycles. A bridging mechanism is needed to provide long term stability to a politicized industry.

Dilemma Number Six: Recognizing A Power Shortage

How we will respond to an electrical power shortage will depend, first, upon the stage of recognition, and second, upon the time at which we act. What first appears as a need to *alleviate* shortage may turn into a program to *manage* shortage. The first approach may be economic; the second political.

The public does not perceive a need for rapid decisions with respect to the role of nuclear power. No event has occurred recently, or is on the immediate horizon, which is likely to dramatize electrical supply. Apart from a general recognition of a need to reduce oil imports, most electrical generation problems are not visible to the ordinary household.

Any significant political action—and political action is essential—will require both Congressional and Executive Branch actions. Congressional action depends upon public mood. The public mood today encourages the hobbling of nuclear power until perceived safety and waste disposal problems are solved. An Administration effort to make a major leap forward today may be difficult—like attempting the long jump standing in quicksand.

Dilemma Number Seven: The Uranium Industry

The uranium industry's fate is wholly dependent upon the nuclear power industry. But special dilemmas concern the uranium industry.

The short term market is somewhat of an anomaly. In a reversal of the usual situation, utility sellers and producer buyers dominate the short term market.

Utilities are contracting for long term needs at a time when public utility commission pressures make it embarrassing to pay above spot prices now, or to accept new contracts which might require paying above the spot price at time of future delivery. Utilities are, therefore, responding to their incentive structures by pressing for contracts which pay market price at time of delivery.

Market price contracts might not be viewed with great uncertainty for most commodities, in which conventional economic forces prevail. But excess uranium inventory selling may continue for some time with pricing dependent upon interest rates, plant schedule delays, and other variables. Conventional economic forecasting may not apply. Not many US producers can afford to accept long term risks. Only very low cost producers are inclined to do so and most are non-US.

The uranium industry is not only surrounded by the general uncertainties of the whole nuclear industry, but with special internal problems of its own.

Dilemma Number Eight: The Ideological Dilemma

Solutions for the aforementioned dilemmas may conflict with political ideology. Needed actions depend, unfortunately, upon more government involvement. The ideology of the present Administration, and the public mood as a whole, is towards less government involvement. It would help if nuclear power could somehow be set aside for wholly objective handling, but unfortunately, that is not possible. Solutions tend to evolve out of a stormy political process.

Unfortunately, I do not think the Reagan program can accomplish much that will show visible effects in the short term. I do believe the Administration can have significant long term impacts if a pragmatic approach is taken. Actions may have to run counter to prevailing ideology. A major accomplishment by this Administration and Congress would be the building of a legal and regulatory framework on which a viable industry could develop in subsequent administrations.

The Magnitude of a Solution

I have described a series of dilemmas so complex and divisive that they cannot be resolved quickly or simply or within present legal and regulatory frameworks. Major surgery is required.

To illustrate the magnitude of required change, let me mention a few specific conceptual changes I think will be needed. This partial listing is only to illustrate the scope of the challenge.

First, the government, especially Congress, will have to decide that active promotion—not passive tolera-

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tion—of nuclear power is in the national interest. The government will have to take affirmative legal action making it advantageous for *shareholders* and consumers to choose nuclear power over other alternatives.

Second, the means provided, as mentioned earlier, must include a system whereby government is accountable for most consequences of government actions. If major new safety criteria are imposed, the government must pay. If a plant is not allowed to operate because the federal government so decrees, the government must pay. Shareholders will not accept open-ended risk when experience has shown that rules continually evolve.

I do not underestimate the difficulty of what I suggest. Government ownership may be the means of last resort. My personal hope is that a formula of government guarantees will be sufficient.

Third, new nuclear plants may be located and managed regionally. A dozen or more plants, as is the case in Japan, could be located at each of several remote and self-contained sites. Safety control might be provided locally—that is, at the locus of operations rather than at the political center of Washington, D.C. Federal or regional authority would override state and other local authorities.

As you have noted, there is little resemblance between what is required and what exists. Merely establishing the groundwork requires five to ten years.

Conclusion

The changes I have outlined require bold action. There is little point, in my view, of further studies. We know what has to be done. The problem is agreement upon the means to the needed ends.

Unless bold action is taken to reshape the economic and political environment, we will continue on the present course of disintegration. The uranium industry, as one example, must confine future expectations to plants in operation, and some fraction of those now listed as committed or in progress. Until there is a strong move forward, concrete evidence of a government framework encouraging a new, practical concept and a consensus as to desirability and practicality, a very, very conservative investment view is to be expected.

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KEY LAKE PROJECT — PART III

Regional Geology

The important uranium deposits of northern Saskatchewan are located along the outer perimeter of the Athabasca Basin. The Cluff Lake deposit is the one exception. The Key Lake orebodies are situated on the southeastern part of the basin rim. Uranium mineralization is known to occur in two different host rocks—quartzites and conglomerates of the Athabasca Formation, and the underlying metamorphosed and altered sediments of the Wollaston Fold Belt. The Athabasca Formation correlates to the Helikian Era of Middle Proterozoic age; the Wollaston Fold Belt relates to the Aphebian Era of Lower Proterozoic age and Archean basement rocks of Early Precambrian. The structural and stratigraphic relationship of the host formations was an important factor in emplacement of the uranium mineralization. Table 7 shows the time correlation between stratigraphic and orogenic events for the area of interest in northern Saskatchewan.

Table 7

GENERALIZED STRATIGRAPHIC AND OROGENIC TIME CORRELATION CHART OF THE GEOLOGY OF NORTHERN SASKATCHEWAN

Geologic Period	Event Formation Orogeny	Age Estimate (millions of years)
Cenozoic	Quaternary Uplift Pleistocene Deposition	~2
Middle Proterozoic	Helikian Era	1650-1300
	Athabasca FM	1350 plus
Lower Proterozoic	Regolith	1630 plus
	HUDSONIAN OROGENY	1735
	Aphebian ERA	1850-1700
	Wollaston Fold Belt	2480-1700
Archean	KENORAN OROGENY	2480 plus
	Wollaston Fold Belt	2500 plus
	Basement	2500 plus

The rocks of the Wollaston Fold Belt were deposited during two periods of early geologic history. The oldest segment is that of Archean basement, consisting of great thicknesses of sedimentary and volcanic rocks intruded by granites. The entire sequence was faulted, folded and metamorphosed during the late Archean Kenoran Orogeny. Granite intrusions continued throughout the orogenesis. Erosion and rock alteration continued from the close of the Kenoran Orogeny to the beginning of the Lower Proterozoic period and the Aphebian Era.

The identifiable rocks of Archean age include granites, biotite and graphitic gneisses, and infolded metamorphosed and altered sediments. Although the rocks are predominantly granite, the metamorphosed and altered sequence shows a broad distribution of coarse to fine-grained rock units. The finer grained material, referred to as metapelites, may contain large amounts of graphite distributed throughout or present as distinguishable intercalated graphitic horizons. The graphitic pelites and the biotite and graphitic gneisses commonly contain abnormal amounts of uranium, especially in association with highly fractured and altered rocks adjacent to prominent fault zones.

Aphebian rocks were deposited unconformably on the Archean rocks. There was large variation in the deposition of the Aphebian sequence. Sandstones, conglomerates, siltstones and some limestones made up much of the sedimentary series. Volcanic flow rocks were dispersed throughout the formation. The entire sequence was subject to metamorphism, faulting and considerable infolding with Archean rocks during the Hudsonian Orogeny which occurred in late Aphebian time. Erosion was again intense following the second orogenesis.

The deposition of Aphebian rocks was influenced by the undulating and linear structural features (northeast-southwest trend) of the Archean rocks. The basal conglomerates and sandstones filled the synclinal troughs to form massive units which were metamorphosed and folded during the Hudsonian Orogeny. The metamorphic series primarily consists of chlorite and graphitic gneisses, and schists, both of which contain anomalous uranium mineralization.

The upper portion of the Aphebian was made up of thick calcium-rich quartzites which experienced extensive weathering and erosion during the long period that ended the Hudsonian Orogeny. The present surface features are much the same as they were at the

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end of the Aphebian period—specifically, northeast-southwest lineation along prominent fault and fold belts and north-south faulting. The subsequent development of basins as a result of settling by Archean basement rocks was probably one of the last important structural events (Hudsonian) to affect the Wollaston Fold Belt.

The Aphebian surface was highly weathered and altered to form a regolith mantle that varies in thickness from a few feet to tens of feet. The deposition of Helikian age sediments followed the Aphebian Era to lie unconformably on the regolith mantle. The broad basins and linear troughs were filled by fluvial sediments of the Martin Formation and the Athabasca Formation. However, the Athabasca Basin was filled entirely by the Athabasca Formation which consists of quartzites eroded from the upper portion of Aphebian rocks. The formation contains basal quartz-pebble conglomerates covered by well sorted and evenly bedded quartzites. A few thin shale beds occur at random throughout the formation. Total formation thickness is about 5,500 feet at the basin center, thinning rapidly to an erosional wedge toward the outer perimeters. Evidence of structural changes in the formation relate to north-south faulting, primarily in the eastern half of the basin; the intrusion of northwest-southeast trending diabase dikes cutting through the southwestern portion; and regional uplifting during Quaternary time which caused extensive erosion of Athabasca sediments to expose the unconformity and the Wollaston Fold Belt rocks, the principal host environment for uranium mineralization.

Uranium Mineralization

The occurrence of uranium mineralization in the Athabasca region is related to pre-Hudsonian orogenesis of Aphebian rocks and lithologic characteristics of the overlying Helikian sediments. Important concentrations of uranium occur in altered brecciated and mylonite zones along major faults in Aphebian rocks, and in the fractures and fissures of lower Athabasca sediments. The host environment for high-grade ore (values exceeding one percent U_3O_8) is predominantly fault-related fissures and shear zones in the highly altered kaolinitic and choloritic mylonites of upper Aphebian rocks. The main host for the mineralization is the kaolinitic mylonite.

Uranium ore minerals are primarily pitchblende and sooty pitchblende, both uranium oxides, and coffinite which is a uranium silicate. The two latter minerals are replacement products of pitchblende. The predominant mineral in the Aphebian rocks is pitchblende. It occurs exclusively in the deeper shears of less altered rocks, grading to sooty pitchblende and coffinite in the upper altered rocks. Uranium minerals in the Athabasca Formation are limited to sooty pitchblende and coffinite, of which coffinite is the most abundant.

Nickel minerals occur in association with uranium at Key Lake. Gersdorffite and millerite are the most abundant of the five nickel minerals present. Both occur throughout the uranium mineralization with high-grade nickel (up to 20 percent), coinciding with high-grade uranium. However, nickel is known to occur to greater depths in the basement as compared to the uranium. Other metals which are present in trace amounts throughout the important zones of mineralization include galena, gold and selenium.

There are several theories concerning the origin of the uranium deposits. In one accepted theory, the uranium is included as a constituent in the sediments at the time of deposition of the Wollaston Fold Belt series. Hydrothermal and metamorphic activity, associated with the Hudsonian Orogeny, allowed uranium-bearing groundwater to pass through the oxidized rocks. The uranium was recrystallized and/or remobilized and deposited in a more concentrated form in structural traps of the Wollaston Fold Belt rocks. The time sequence for these mineralizing events is approximately 1900 to 1350 millions of years.

Uranium deposition in the Athabasca Formation is limited to the basal units and the unconformity. Further remobilization of uranium in the older rocks resulted in the concentration of ore along fault zones and on fractures in the lower Athabasca units. The age of mineralization is estimated at 1350 to 200 millions of years. Sooty pitchblende and coffinite were developed during the last stage of mineralization. Generally, the mineralizing process occurred throughout several prolonged periods of hydrothermal alteration and remobilization of the minerals, with the greatest movement and concentration of mineralization occurring during the events of 1350 to 200 millions of years.

Orebody Geology

The two uranium deposits at Key Lake are situated less than one mile apart on a common structural feature. It is probable that the Gaertner and Deilmann

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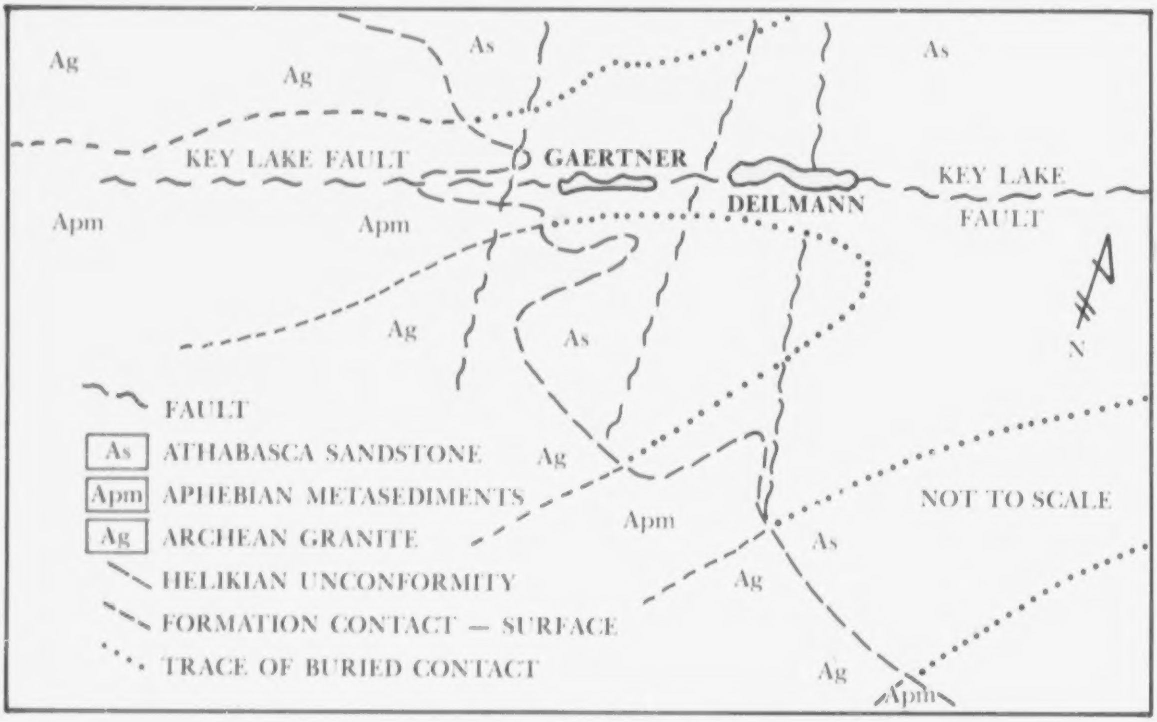
RAW MATERIALS


Ag
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KEY LAKE FAULT
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DEILMANN
KEY LAKE
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As ATHABASCA SANDSTONE
Apm APHEBIAN METASEDIMENTS
Ag ARCHEAN GRANITE
HELIKIAN UNCONFORMITY
FORMATION CONTACT — SURFACE
TRACE OF BURIED CONTACT
Ag
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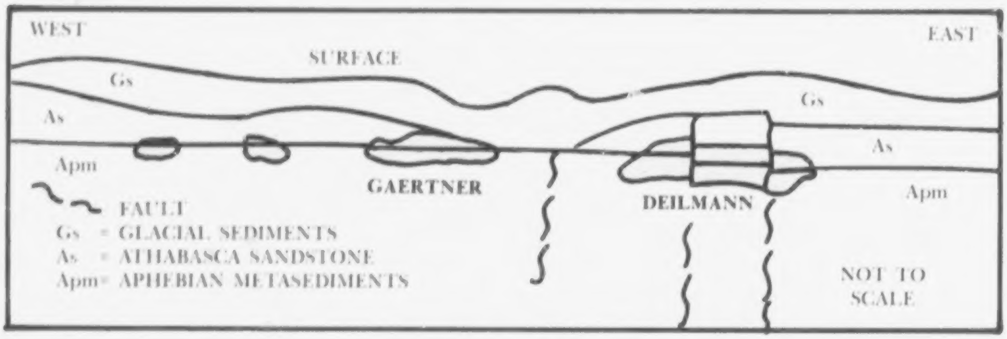
Figure 1
GENERALIZED GEOLOGIC MAP OF THE KEY LAKE URANIUM DISTRICT


WEST
SURFACE
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GAERTNER
DEILMANN
Apm
FAULT
Gs = GLACIAL SEDIMENTS
As = ATHABASCA SANDSTONE
Apm= APHEBIAN METASEDIMENTS
NOT TO
SCALE

Figure 2
GENERALIZED LONGITUDINAL SECTION THROUGH THE GAERTNER & DEILMANN URANIUM DEPOSITS, KEY LAKE PROJECT

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orebodies originally formed one ore zone and are now separated as a result of Quaternary erosion. Athabasca sediments have been completely eroded away between the orebodies, and glacial sediments lie unconformably on Aphebian rocks. A few small satellite orebodies occur along the same structural feature, or within parallel structures that are compatible with the main zone.

The main orebodies are restricted to the Key Lake fault zone which is the predominant northeast-southwest trending structure in the district. The zone actually consists of multiple parallel faults conforming to the pattern of lineation that developed during the Hudsonian Orogeny. The faulting evolved along one of the thicker graphitic metapelites zones and created displacement of tens of meters in the Aphebian rocks. Movement along the fault zone continued into the Middle Proterozoic Period as expressed by post-Hudsonian displacement of Athabasca sediments at the unconformity. Figure 1 is a generalized geologic map of the Key Lake area.

Uranium mineralization is concentrated along the Key Lake fault zone in veins and shears of deeply altered Aphebian rocks, at the unconformity, and in the lower units of Athabasca sediments. North-northeast faulting which is post-Key Lake faulting, cut through the main structural zone to further displace all host rocks, and influence emplacement of ore, especially during later mineralizing periods. However, the greatest quantity of ore occurs along the central area of the Key Lake fault zone where brecciation and mylonitization has been most intense. The breccia zone consists of fragments of both Athabasca sediments and Aphebian rocks which have been altered completely to kaolinite and chlorite. In this environment, the minerals fill the shears and fissures in depth and develop into large irregular orebodies at the sub-Athabasca unconformity. Mineralization is restricted to fractures in the lower units of the Athabasca Formation.

The importance of the unconformity and the fault patterns to mineralization is supported by the fact that all minable uranium is concentrated within a zone about one hundred meters below and only a few meters above the conformity. More precisely, the Gaertner orebody has a maximum width of 90 meters and extends vertically only about 60 meters; the measurements of the Deilmann orebody are 200 meters and 120 meters respectively. Figure 2 is a generalized longitudinal section of the two Key Lake deposits.

Summary

The main ore control for the Key Lake deposits is related to the pre-Hudsonian tectonic and sedimentary environment. Uranium-rich sediments were deposited, later metamorphosed, and altered to develop local concentrations of uranium as the first stage of mineralization. Prolonged hydrothermal and tectonic activity caused remobilization and/or recrystallization. This was followed by precipitation of uranium during Hudsonian orogenesis, resulting in additional concentration of uranium in the favorable host environment of Aphebian rocks. The mineralizing process continued into post-Hudsonian time to further enrich the veins and shear zones at the sub-Helikian unconformity and in fractures of the lower Athabasca quartzites. The age of mineralization (estimated from about 1900 to 200 millions of years) indicates that the mineralizing process occurred throughout several distinct episodes of geologic history. The fact that remobilization of uranium is continuing to a limited degree is supported by the anomalous radioactivity that lead to the discovery of uranium deposits in the Key Lake area.

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STATISTICAL DATA

EXCHANGE VALUE \$23.50/lb. U_3O_8
Determined as of November 30, 1981

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

TRANSACTION VALUE
Determined as of November 30, 1981

\$/lb U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
24.10	2.1	10	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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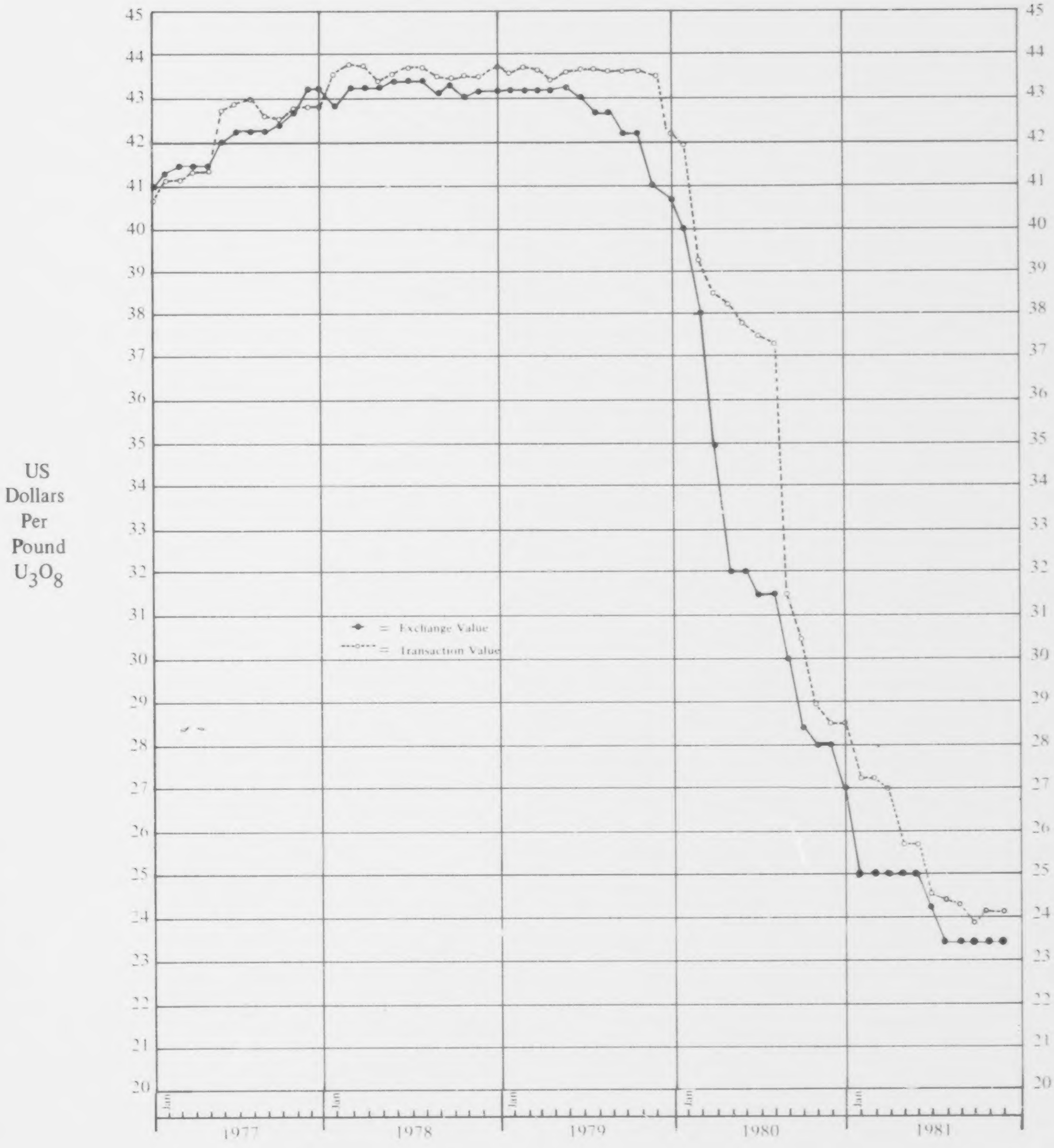
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1977

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	–	–	–	–	–	–	–	6.35	6.35	6.40	6.45	6.50
1969	–	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	–	–	–	–	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES*

Country	per lb U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	23.50	51.81	61.09
France (franc)	131.21	289.27	341.12
FRG (mark)	52.00	114.65	135.20
Japan (yen)	5,065	11,166	13,167
Switzerland (franc)	41.67	91.88	108.34
UK (pound)	12.01	26.47	31.21
Australia (dollar)	20.42	45.01	53.08
Canada (dollar)	27.66	60.98	71.91
Niger, Gabon (CFA)	6,528	14,391	16,971
South Africa (rand)	22.65	49.94	58.89
Sweden (kröner)	128.42	283.11	333.85

*Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of November 30, 1981

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.

B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE 6%
Determined as of November 30, 1981

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.

B. Rates included in firm proposals to borrow or lend.

C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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STATISTICAL DATA

CURRENT TRANSACTIONS*

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as percent of Current E.V.	Seller Group	Buyer Group	Remarks
1650	1981	50 to 100	99	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as percent of Current C.V.	Seller Group	Buyer Group	Remarks

none reported

---

*Transactions listed include not only those in which Nuexco was involved but also all others of which Nuexco is aware.

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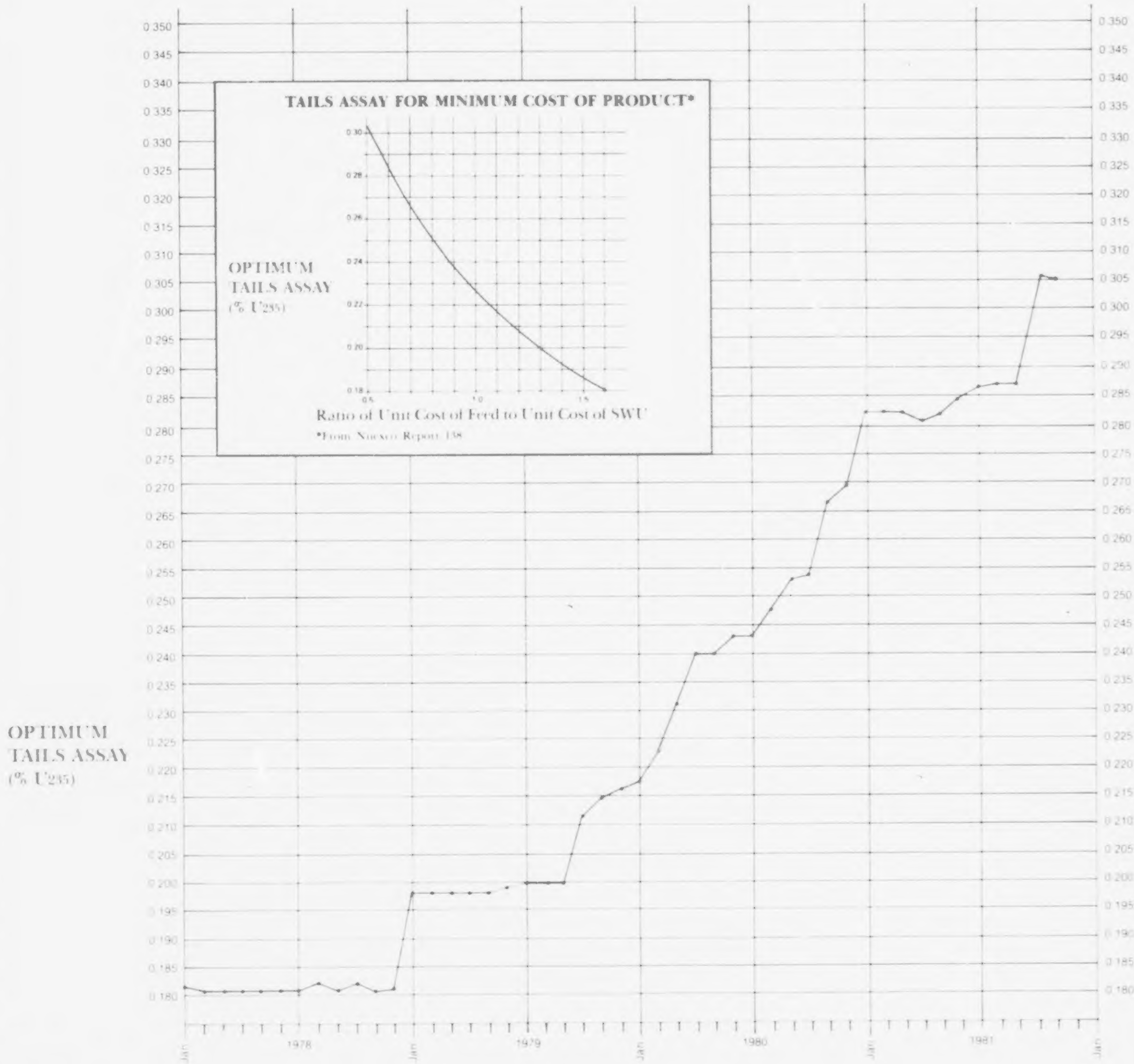
STATISTICAL DATA

OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index—Industrial Commodities (1967 = 100)[1]	Producer Price Index—All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1970[5]	110.0	110.4	116.3	91.36	3.88	3.87	3.69	3.28
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Jun 1980	273.5	265.6	247.6	178.93	10.14	10.70	8.25	6.86
Jul 1980	276.2	270.4	247.8	—	10.24	10.83	8.36	6.95
Aug 1980	278.2	273.8	249.4	—	10.39	10.79	8.40	7.01
Sep 1980	278.8	274.6	251.7	182.92	10.55	10.95	8.47	7.12
Oct 1980	282.2	277.8	253.9	—	10.59	11.01	8.53	7.18
Nov 1980	283.4	279.1	256.2	—	10.73	11.07	8.60	7.27
Dec 1980	286.6	280.8	258.4	183.98	10.84	11.32	8.69	7.38
Jan 1981	291.5	284.8	260.5	—	10.91	11.31	8.74	7.41
Feb 1981	295.7	287.6	263.2	—	11.15	11.36	8.80	7.43
Mar 1981	299.6	290.3	265.1	188.14	11.13	11.50	8.84	7.47
Apr 1981	303.5	293.4	266.8	—	11.30	11.63	8.94	7.51
May 1981	304.7R	294.1R	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1R	294.8R	271.3	191.06	11.31	11.88	9.07	7.60
Jul 1981	306.0P	296.0P	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.0P	296.2P	276.5	—	11.85R	12.09R	9.19R	7.76P
Sep 1981	307.2P	295.5P	279.3	195.44R	12.12P	12.95P	9.38R	7.79R
Oct 1981	308.8P	296.0P	279.9	—	—	—	9.32P	7.78P

P = Preliminary   R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNMP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1970[3]	101.4	59.88
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	217.96
Jul 1980	347.8	221.52
Aug 1980	352.0	220.08
Sep 1980	350.3	219.60
Oct 1980	348.2	221.13
Nov 1980	350.4	221.50
Dec 1980	351.7	221.81
Jan 1981	357.8	229.97
Feb 1981	356.6	229.79
Mar 1981	355.2	229.04
Apr 1981	354.6	228.76
May 1981	353.4	236.67
Jun 1981	360.4	236.99
Jul 1981	357.5	236.85
Aug 1981	360.3R	236.85P
Sep 1981	357.8P	236.82P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 1.7 and 1.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Jul 1980	246.3	10.49	8.11	8.55
Aug 1980	249.4	10.58	8.14	8.65
Sep 1980	252.0	10.85	8.24	8.71
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.8	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3	11.27	8.51	8.90
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.7R	11.47	8.63	9.17
Apr 1981	268.1R	11.73	8.76	9.33
May 1981	270.1R	11.80	8.90	9.49
Jun 1981	272.4R	11.80	9.16R	9.57R
Jul 1981	274.3R	11.92P	9.20P	9.58P
Aug 1981	276.1R	11.79P	9.15P	9.62P
Sep 1981	276.9P	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1970[3]	7.34	100.3[4]		655,346	399,164
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Jul 1980	—	177.2	192.7	715,460	202,403
Aug 1980	—	179.2	196.8	716,486	206,514
Sep 1980	36.19	182.8	199.8	710,889	204,761
Oct 1980	—	186.3	203.1	720,246	204,602
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	—	—	227.0	—	—

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[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 19 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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EXECUTIVE SUMMARY & INDUSTRY OVERVIEW
NUEXCO REPORT 160

Exchange Value Steady at $23.50

The **Exchange Value** remained at $23.50 per pound U_3O_8 for the fifth consecutive month. However, the current price level is significantly firmer than it was three to four months ago. While sellers actively competed for sales opportunities, they were generally unwilling to undercut Exchange Value to increase their prospects for making a sale.

Near Term Supply and Demand Firming

As indicated in the *Market Opportunities* section, the total of material available for sale in the near term is about 7.1 million pounds U_3O_8. The total of demand in the same time frame is about three million pounds U_3O_8. This firming of supply and demand, coupled with the lowering of interest rates, is relieving some of the pressure felt by utility inventory sellers.

Transaction Value $24.10, Unchanged

The **Transaction Value** remained at $24.10 per pound U_3O_8 for the second consecutive month. One transaction, a near term sale between two US producers, is reported this month.

Conversion Value Increases to $1.20, Up Ten Cents

The **Conversion Value** rose ten cents to $1.20 per pound U as UF_6. While available supply of secondary market conversion services outweighs demand by more than 13 to one in the near term, both buyers and sellers have indicated a willingness to discuss sales at this higher price level. There are no transactions of secondary market conversion services reported this month.

Seamen's Union Ban Ordered Halted

In Australia, Mary Kathleen Uranium Ltd. won an injunction against the Seamen's Union which will legally prevent the union from enforcing its ban on uranium shipments.

Framatome Becomes A Partnership

France's nuclear reactor manufacturer will become a three-way partnership with its two largest shareholders. The French government did not approve the Framatome merger with Creusot Loire.

US Uranium Inventory of 312 Million Pounds

Total US inventory consisted of 312 million pounds U_3O_8 equivalent as of January 1, 1981. The US inventory position is broken down by ownership and by material form and is analyzed in this month's Report.

Impact of US Reactor Cancellations Discussed

From June 1979 to June 1981, 23 reactors comprising some 25,000 MWe were cancelled in the US. The *Essay* discusses the resulting reduction of cumulative demand for uranium and also estimates the probable future cancellations and their effect on demand.

Dilemmas of Nuclear Power Presented; Key Lake Geology Focus

A slightly edited version of a recent speech by J. Robert Wolcott (President of Nuexco) is presented in the *Commentary* section.

The *Raw Materials* essay continues the two previous months' discussion of Canada's Key Lake Project with the emphasis on the uranium mineralizing process.

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NUEXCO

JANUARY 1982 NUMBER 161

Monthly Report on the Uranium Market

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NUEXCO

MONTHLY REPORT ON THE URANIUM MARKET

January 1982 No. 161

R. WESLEY MILLER, *EDITOR* TERESA L. ELMS, *ASSOCIATE EDITOR*

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NOTICE

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URANIUM MARKET

PRICING

December 1981

The **Exchange Value** as of December 31, 1981 is $23.50 per pound U_3O_8, unchanged from the five previous months. The price firming trend noted in last month's Report continued during the early part of December, but new weakness developed towards month end and precluded any increase in Exchange Value.

December has historically been marked by unusual levels of market activity as buyers and sellers conclude year end transactions, primarily motivated by financial considerations. Six of the nine uranium sales reported this month are in this category.

Near the end of December, several new lots of material became available for 1982 delivery at prices which are suggestive more of price stability than price strengthening. Also, several deals involving a total of nearly two million pounds U_3O_8 are under discussion at similar price levels. These two factors combined to prevent Exchange Value from rising.

While an upturn in prices is anticipated by a number of buyers and sellers, substantial utility inventories and uncommitted incremental production continue to overhang the spot and near-term markets. Until these quantities are cleared or withdrawn, their presence will impede any sustained upward price movement.

The **Transaction Value** decreased ten cents to $24.00. This month's Transaction Value includes eighteen transactions totaling 2.5 million pounds U_3O_8 covering four months. The **Loan Use Charge Rate** remained at six percent.

The **Conversion Value** remained at $1.20 per pound U as UF_6. After a period of considerable activity earlier in 1981, the secondary conversion market has been relatively quiet in recent months. Sellers continue to outnumber buyers; currently only two or three buyers are considering purchases.

1981 In Review

The uranium market experienced relatively stable prices in 1981. Exchange Value was constant at $25.00 during the first five months of the year, and for five consecutive months in the second half the Exchange Value was $23.50 per pound, as seen in Table 1.

Two significant buyer and seller groups were active during 1981:

1. Utility sellers offered large amounts of inventory;
2. Producer buyers were responsible for much of the increased demand of 1981.

In early 1981, the amount of material offered for sale in the spot and near term market was on the order of nine to ten times the amount of inquiries to purchase. However, this ratio fell steadily during the middle of the year and since August has held at about two to one, due mainly to two factors: (1) Beginning in March, the strong downward pressure of material for sale by holders of inventory was mitigated somewhat by the large

Table 1
1981 EXCHANGE VALUES AND CONVERSION VALUES

Effective as of the Last Day of the Month Indicated	Report	Exchange Value (per pound U_3O_8)	Conversion Value (per pound U_3O_8)
January	150	$25.00	$1.20
February	151	$25.00	$1.20
March	152	$25.00	$1.20
April	153	$25.00	$1.40
May	154	$25.00	$1.15
June	155	$24.25	$1.15
July	156	$23.50	$1.15
August	157	$23.50	$1.10
September	158	$23.50	$1.10
October	159	$23.50	$1.10
November	160	$23.50	$1.20
December	161	$23.50	$1.20

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quantities of material sought under producer inquiries to purchase. These producers, contemplating shutdowns of high cost production facilities, entered the market for low priced material to fulfill existing contracts. (2) In addition, what were perceived as bargain prices stimulated some users to enter the market with demand for near term deliveries.

The large amount of inventory selling by user entities during 1981 continued the downward pressure on the market price observed during 1980. Throughout the second half of this year, the quantity of material offered for sale by holders of inventory averaged about the same level or somewhat higher than material offered for sale by producers. From July on, offers from inventory holders continually ran between 3.5 and five million pounds U_3O_8. Table 2 chronicles the 1981 near term supply and demand figures published by Nuexco, including the percentage of material offered by inventory sellers.

Increased buyer interest by both users and producers was the principal firming mechanism in the spot market price during 1981. In August, inquiries to purchase jumped to about four million pounds U_3O_8 compared to an average of 1.5 million pounds U_3O_8 over prior months. The percentage of inquiries to purchase by other than primary users increased from zero to 69 percent between March and April, as shown in Table 2, and comprised a fairly large percentage of the total over the last several months. Most of the inquiries were made by US producers. Even more significant, however, was the amount of material sought by non-primary users during the latter part of 1981. This amount averaged about two million pounds U_3O_8.

The relative stability of the 1981 market is evident by comparing the 1980 and 1981 trends of the Exchange Value and Transaction Value. In 1980, the Exchange Value dropped about $13.00 during the course of the year, and the Transaction Value dropped over $14.00. Exchange Value during 1981 dropped $3.50 from the December 1980 value of $27.00; Transaction Value dropped $3.70 from the December 1980 level of $27.70.

The drop in Exchange Value during mid-year 1981 was preceded by the offering of small amounts of material, and some sales, during March and April at prices lower than the then current Exchange Values. Although that development indicated a weakening of the spot and near term markets, the amount of material which changed hands at the lower price level was

Table 2

1981 SPOT AND NEAR TERM SUPPLY AND DEMAND

(As reported by Nuexco)

Spot and Near Term Inquiries
(thousands of pounds U_3O_8)

Nuexco Report Number	To Sell	Percent Inventory Holders	To Purchase	Percent Non-Primary User	Ratio of Supply To Demand	Exchange Value (per pound U_3O_8)
150	8,200	38	710	0	12:1	$25.00
151	8,510	42	900	0	9:1	$25.00
152	8,280	36	2,115	69	4:1	$25.00
153	7,060	46	1,550	65	5:1	$25.00
154	7,700	51	1,750	57	4:1	$25.00
155	5,200	49	1,000	100	5:1	$24.25
156	5,360	52	1,400	18	4:1	$23.50
157	7,210	55	3,970	37	2:1	$23.50
158	7,420	53	4,075	59	2:1	$23.50
159	7,980	56	4,345	66	2:1	$23.50
160	7,110	63	3,070	56	2:1	$23.50
161	8,845	57	4,250	33	2:1	$23.50

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"commercially insignificant" because of transactions for much larger quantities at higher prices. Nevertheless, the emergence of offers and sales at lower prices had set the stage for the month of June in which "transactions of sizable blocks of U_3O_8" at prices less than the then Exchange Value led to the year's first drop in the level of Exchange Value. The weakening of Exchange Value was also due to sellers agressively discounting prices of U_3O_8 in order to increase their chances of making a sale. As a few buyers successively entered the market, they attracted considerable competition among sellers, putting more pressure on prices.

Table 3

AVERAGE INDIVIDUAL QUANTITIES OF INQUIRIES TO SELL AND TO PURCHASE BY MONTH, PUBLISHED BY NUEXCO DURING 1981

Nuexco Report Number	Spot and Near Term Supply	Spot and Near Term Demand
	(thousands of pounds U_3O_8)	
150	550	180
151	610	230
152	550	420
153	470	520
154	510	440
155	400	1,000
156	360	280
157	420	440
158	410	510
159	460	400
160	370	440
161	442	425

The year 1981 was also marked by erratic entrances and exits of major blocks of U_3O_8. This occurred with producer buyers entering the market along with utility sellers. The large average individual quantities of purchase and sale inquiries are seen in Table 3. Towards the end of 1981, this condition was expressed by the term "unstable equilibrium" and the following explanation: "With so many inventory holders actively trying to sell, it is possible that several will become aggressive at the same time and combine to drive prices down. At the same time, decisions by several producers to lock up near-term supply, as an alternative to producing material themselves to deliver under supply contracts, could firm up prices." The market entering 1982 will continue to act under these forces.

The "unstable equilibrium" of the present market could be altered if the opposing forces of supply and demand shift somewhat during 1982. If utilities anticipating unfilled requirements in the mid-1980s decide to enter the market in 1982 to meet them, some strengthening of the intermediate and long term markets could occur. More than a dozen utilities fall into that category. On the other hand, many national buying organizations are considering whether to reduce their stockpiles. If several large blocks of material entered the market simultaneously, prices could be driven down sharply. The effects of these two opposing market forces on near term market prices are difficult to predict, both in magnitude and timing.

During 1981, a strong secondary market for conversion services emerged. As inventories mounted and carrying costs grew, utilities made the decision to sell inventory only to encounter a market in which U_3O_8 was the form of material most in demand. Because their inventories were largely in the form of UF_6, the utilities sought ways to substitute U_3O_8 for UF_6 so they could respond competitively to inquiries to buy U_3O_8. Certain of these utilities were willing to offer future contracted conversion services or the conversion component of their UF_6 for sale at a price significantly below that of the primary market. Hence, the term "secondary market."

A utility wishing to "deconvert" its material would often exchange UF_6 for an equivalent quantity of concentrates, plus cash or additional concentrates as payment for the conversion services. A utility wishing to sell excess conversion services also has the option to assign a future conversion contract, partially or completely, to another utility. The mechanisms of the various conversion transactions were detailed in Nuexco Report Number 150.

The secondary market for conversion services during 1981 exhibited strong demand in the long term and strong supply in the near term. Those utilities who wished to take advantage of the low cost of conversion services in the secondary market usually did not need the conversion for several years. Their immediate needs were covered by a contract with a primary converter. This made for a near term market which was, at times, very thin. The changes in Conversion Value, shown in Table 1, reflected the degree of desire of sellers wishing to

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deconvert to respond to U_3O_8 opportunities; a utility strongly committed to selling inventory would be less price sensitive than a utility testing the market.

The withdrawal of low cost sellers from the market accounted for the substantial *increase* in Conversion Value in April, occurring in the midst of an apparent oversupply. The following month's *decrease* of 25 cents demonstrated the volatility of the thin market and the influence of limited opportunities upon the market as a whole. In addition, the subsequent slow decline in Conversion Value was the result of aggressive marketing on the part of primary converters, particularly in the longer term, in response to secondary market competition.

TRANSACTIONS

December Transactions

There are nine uranium sales transactions reported this month:

1. A US producer signed a long term contract with a US utility for between two million and four million pounds U_3O_8. Delivery will take place between 1983 and 1993.

2. A Canadian producer sold between 100 thousand and 300 thousand pounds U_3O_8 to a European utility.

There were seven more transactions reported during December, all for relatively small quantities and all for spot or near term delivery:

3. In three separate instances US producer sellers and US producer buyers concluded transactions for immediate delivery with quantities less than 50 thousand pounds.

4. A European seller sold between 50 thousand and 100 thousand pounds U_3O_8 to a European buyer with delivery taking place immediately.

5. A US utility sold less than 50 thousand pounds U_3O_8 to a US producer with delivery taking place in 1981.

6. A US producer sold less than 50 thousand pounds U_3O_8 to a US utility with delivery taking place in 1981.

7. Finally, a US seller sold less than 50 thousand pounds U_3O_8 to a US producer for immediate delivery.

In this month's only reported loan transaction, a European firm lent between 100 thousand and 300 thousand pounds U_3O_8 to a Canadian producer. The material will be delivered early in 1982 and replaced in two or three years.

There are no conversion transactions reported this month.

1981 Transactions

Uranium sales in 1981 reflected the general withdrawal of US suppliers from the intermediate and long term markets and included a substantial proportion of producer purchases and utility sales in the spot and near term markets. Table 4 details the geographical flow of the material sales over the past year by breaking down the transactions reported in the Nuexco Reports in 1981 according to buyer and seller regions. Table 4 includes only those transactions which were reported in the Nuexco Report and is not intended to represent all the transactions which took place during 1981. Certain transactions are not included, either because reporting them would compromise the source of the material or because Nuexco became aware of the transaction at a point when reporting it would no longer be timely.

Sellers and buyers in the United States dominated the spot and near term market volume, as Table 4A shows. Twenty-four of the 33 spot or near term transactions, comprising almost 60 percent of the material, occurred between US sellers and US buyers. Most of the rest had one US participant. Table 5A, which shows the corresponding data for 1980, indicates that the geographical flow of material in 1981 was quite similar to that of 1980. The US-to-US transactions constituted most of the contracts signed as well as most of the volume. What did change considerably, however, is the total amount of material that was sold in the spot and near term markets. While the volume of sales in the spot and near term markets was more than 12 million pounds U_3O_8 in 1980, it dropped 50 percent in 1981 to less than six million pounds.

In the longer term market (contracts with deliveries taking place more than one year after contract signature) Australian and Canadian sellers were dominant, as Table 4B outlines. Three-quarters of the longer term material sold came from producers in these two countries. US sellers accounted for only one-sixth of the material sold, reflecting the effects of high production costs. In 1981, the US was less of a factor in the long term market than it was in 1980 (Table 5B). At the same time, Australia and Canada increased their market share. The volume of sales in the longer term markets dropped 13 percent, from approximately 42 million pounds U_3O_8 in 1980 to approximately 36.5 million pounds in 1981.

Table 6 breaks down according to status, producer or non-producer, the same spot and near term transactions

Table 4

SUMMARY OF URANIUM SALES TRANSACTIONS REPORTED IN THE NUEXCO MONTHLY REPORT DURING 1981[1]

(number of transactions and thousands of pounds U_3O_8)

A. SPOT[2] AND NEAR TERM[3] TRANSACTIONS

	Buyer Group				
Seller Group	**Europe**	**Far East**	**US**	**Other**	**Total**
Africa					
Australia					
Canada	(1) 200		(1) 400		(2) 600
US	(3) 700	(4) 1,100	(24) 3,400		(31) 5,200
Other					
TOTAL:	(4) 900	(4) 1,100	(25) 3,800		(33) 5,800

B. LONGER TERM[4] TRANSACTIONS

	Buyer Group				
Seller Group	**Europe**	**Far East**	**US**	**Other**	**Total**
Africa					
Australia	(3) 18,900				(3) 18,900
Canada	(1) 3,400		(2) 4,700		(3) 8,100
US			(5) 6,000		(5) 6,000
Other		(1) 3,500			(1) 3,500
TOTAL:	(4) 22,100	(1) 3,500	(7) 10,700		(12) 36,500

[1] Nuexco Reports 150-161. Loans not included.

[2] Spot means immediate delivery.

[3] Near term means all deliveries completed within 12 months after contract execution.

[4] Longer term means final delivery takes place more than 12 months after contract execution.

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Table 5

SUMMARY OF TRANSACTIONS REPORTED IN THE NUEXCO MONTHLY REPORT DURING 1980[1]

(number of transactions and thousands of pounds U_3O_8 involved)

A. SPOT AND NEAR TERM TRANSACTIONS

	Buyer Group				
Seller Group	**Europe**	**Far East**	**US**	**Other**	**Total**
Africa				(2) 1,000	(2) 1,000
Australia					
Canada	(1) 300		(1) 800	(1) 100	(3) 1,200
US	(9) 2,200	(1)*	(32) 6,100[3]	(1)*	(43) 8,300
Other	(5) 1,000[4]	(1)*	(1) 200	(1) 400	(8) 1,600
TOTAL:	(15) 3,500[4]	(2)*	(34) 7,100[3]	(5) 1,500	(56) 12,100

B. LONGER TERM TRANSACTIONS[2]

	Buyer Group				
Seller Group	**Europe**	**Far East**	**US**	**Other**	**Total**
Africa	(2) 8,700	(1) 8,000			(3) 16,700
Australia	(2) 4,800[6]	(1) 3,000[6]	(1) 4,500		(4) 12,300[6]
Canada		(1) 4,200			(1) 4,200
US	(4) 1,600	(1) 3,100	(2) 3,400		(7) 8,100
Other				(1) 600[5]	(1) 600
TOTAL:	(8) 15,100	(4) 18,300	(3) 7,400	(1) 600	(16) 41,900

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[1] Nuexco Reports 138 through 149.

[2] Near term means delivery within one year after contract signature. Longer term means final delivery more than one year after contract signature.

[3] Includes four loans totaling 900,000 lbs. U_3O_8 equivalent and two U_3O_8/UF_6 swaps totaling 400,000 lbs. U_3O_8 equivalent.

[4] Includes one loan totaling 100,000 lbs. U_3O_8.

[5] Includes one loan totaling 600,000 lbs. U_3O_8.

[6] Totals for Australia do not include 1980 transactions between Energy Resources of Australia and its Japanese and German shareholders.

*Quantities less than 50,000 pounds U_3O_8.

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Table 6

SUMMARY OF SPOT AND NEAR TERM URANIUM SALES TRANSACTIONS REPORTED IN THE NUEXCO MONTHLY REPORT DURING 1981

(number of transactions and thousands of pounds U_3O_8)

	Buyer				
Seller	**US Producer**	**US Non-Producer**	**Non-US Producer**	**Non-US Non-Producer**	**Total**
US Producer[1]	(13) 1,000	(6) 800		(5) 900	(24) 2,700
US Non-Producer[2]	(3) 600	(2) 1,000		(2) 900	(7) 2,500
Non-US Producer		(1) 400		(2) 300	(3) 700
Non-US Non-Producer					
TOTAL:	(16) 1,700	(9) 2,200		(9) 2,100	(34) 5,900

[1] "Producer" means any company directly involved in mining uranium.

[2] "Non-producer" includes utilities, government agencies, fuel fabricators and others not directly involved in mining uranium.

Table 7

SPOT AND NEAR TERM[1] SALES TRANSACTIONS REPORTED IN THE NUEXCO MONTHLY REPORT DURING 1980[2]

(number of transactions and thousands of pounds U_3O_8)

	Buyer				
Seller	**US Producer**	**US Non-Producer**	**Non-US Producer**	**Non-US Non-Producer**	**Total**
US Producer[3]	(9) 1,475	(8) 1,591		(8) 1,371)	(25) 4,437
US Non-Producer[4]	(6) 1,055	(4) 1,176		(3) 385	(13) 2,616
Non-US Producer		(1) 750	(2) 370	(5) 2,092	(8) 3,212
Non-US Non-Producer		(1) 210	(1) 210	(1) 28	(3) 448
TOTAL:	(15) 2,530	(14) 3,727	(3) 580	(17) 3,876	(49) 10,713

[1] Near term means delivery within one year after contract signature.

[2] Nuexco Reports 138 through 149

[3] "Producer" means companies directly involved in mining uranium.

[4] "Non-producer" includes utilities, government agencies, fuel fabricators and others not directly involved in mining uranium.

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reported in Table 4. The somewhat unstable market conditions of 1981 were unusual in that there was a large amount of sales activity by utilities and other non-producers and a substantial amount of purchasing activity by producers. Sales by US non-producers accounted for 42 percent of the spot and near term volume in 1981; purchases by US producers accounted for almost 30 percent of the spot and near term volume. Conventional transactions, sales from producers to non-producers, accounted for only 40 percent. (The percentages total more than 100 because some non-producers sold to producers.) These percentages are similar to those of 1980 shown in Table 7; the major difference is in the much smaller volume of material sold in 1981.

Finally, Table 8 breaks down the conversion transactions that occurred in 1981 and were reported in the Nuexco Monthly Report. All of the transactions listed in Table 8B were secondary transactions, i.e., sales in which a primary converter was not the seller. Table 8 also shows that while the volume of conversion sales (including both the primary and secondary markets) was significant, the majority of the sales occurred in the US.

These various tables would suggest a shift in long term emphasis to non-US markets both for supply and demand. While activity in the US continued to dominate the near term market, much of this activity reflected a redistribution of inventory from utilities to high cost producers. In the longer term, low-cost Canadian and Australian suppliers, despite certain government imposed restrictions, have competitive advantage in the marketplace. European buyers are becoming the demand segment most significant for the long term, while the US nuclear industry stagnates.

Table 8

SUMMARY OF CONVERSION TRANSACTIONS REPORTED IN THE NUEXCO MONTHLY REPORT DURING 1981

(number of transactions and thousands of pounds U)

A. SPOT AND NEAR TERM TRANSACTIONS

	Buyer Group				
Seller Group	**Europe**	**Far East**	**US**	**Other**	**Total**
Africa	—	—			
Australia	—				
Canada	—				
US	—		(7) 4,600	(1) 500	(8) 5,100
Other	—				
TOTAL:	—		(7) 4,600	(1) 500	(8) 5,100

B. LONGER TERM TRANSACTIONS

	Buyer Group				
Seller Group	**Europe**	**Far East**	**US**	**Other**	**Total**
Africa	—				
Australia	—				
Canada	—				
US	—		(2) 2,000		(2) 2,000
Other	—				
TOTAL:	—		(2) 2,000		(2) 2,000

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URANIUM MARKET

AFRICA

South Africa's nuclear power program made substantial progress during 1981. The Electricity Supply Commission (ESCOM) Koeberg project remains on schedule with start-ups planned for late 1982 and late 1983 for Units 1 and 2 respectively. South Africa is also planning to designate a second nuclear plant site.

The biggest potential problem for the South African nuclear program is that of enrichment safeguards. Although ESCOM has temporarily solved the problem of enriched uranium supply for the Koeberg units, the question of enrichment safeguards remains.

South Africa's uranium production held up fairly well during 1981. Although West Rand Consolidated ceased uranium production in August and put its uranium plant on standby, total South African uranium production for 1981 should match 1980's total of 15.7 million pounds U_3O_8.

Comparing uranium production in South Africa over the past three quarters reveals a slight downward trend, from 4.1 million pounds U_3O_8 in the first quarter of 1981 to 3.95 million pounds in the second and 3.85 million pounds in the third. With most of its production committed under long-term higher priced contracts, South Africa has been reluctant to participate in the spot market at current price levels and, as a consequence, some uncommitted production is being stockpiled in anticipation of higher prices in the future.

For the most part, South African uranium producers have curtailed long term expansion plans and are limiting additional development to that necessary to supply existing commitments. As Beisa and Western Areas come on stream, South African production will probably rise somewhat in 1982 and 1983. In spite of the weak market, the substantial reserves and extensive infrastructure of South Africa's uranium producers leave them well positioned to increase production rapidly if demand rises substantially or when the price structure allows them to displace more costly production.

The resilience of the South African uranium industry in this period of relatively low market prices is due to several factors:

1. Production costs are generally low, because so much of South African uranium is produced as a byproduct or a coproduct of gold.
2. The richness of South Africa's gold deposits enables the gold producers to remain profitable, even if both uranium and gold market prices are low.
3. Because all South African gold sales are payable in US dollars, the effect of the fall in the price of gold has been largely cushioned by the increase in value of the rand with respect to the US dollar.
4. The structure of South Africa's industry lends flexibility to producers' operations. For example, Vaal Reefs was able to link up with Afrikander Lease and is now supplying the latter's customer. Also, St. Helena was able to use its tax shield to take over Beisa and maintain the viability of that uranium production operation.
5. The multitude of uranium-bearing reefs enhances operational flexibility. For example, Randfontein switched reefs to make up a uranium shortfall encountered in the millsite section.
6. South Africa's reputation for reliable supply has been an important factor in developing loyalty and sound long term relationships among its traditional customers.

In **Southwest Africa (Namibia)**, 1981 production at the Rossing facility will approximate 1980's total of some 10.5 million pounds U_3O_8. Essentially all this production was delivered under long-term agreements. Development of additional production capability must await strengthened demand and prices as well as resolution of current political uncertainties.

AUSTRALIA

Production plans in Australia, for the most part, proceeded on schedule during 1981. The Ranger uranium project, owned by Energy Resources of Australia (ERA), was brought to completion in October 1981, twelve years after its discovery. The project has a design capacity of 3,000 tons of uranium per year and the mine and mill are presently working at the full level. A sales contract signed in January with the Swedish utility Oskarshamnsverkets Kraftgrupp Actiebolag (OKG) for 2,845 tons U_3O_8 brought the sales commitments of ERA to 40,000 tons. Concurrent with the purchase, OKG acquired a one percent shareholding in ERA. Together with other Australian uranium producers, ERA experienced shipping delays of its uranium production because of union bans at the waterfront, but the reversal of union policy now enables unhindered export of uranium from Australian ports. ERA increased the reserves of the Ranger No. 3 orebody by 15,100 tons U_3O_8 contained in probable ore.

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Pilot plant programs associated with the first stage of the Yeelirrie uranium development (75 percent owned by Western Mining Corp. (WMC)) were successfully completed during 1981. WMC will market directly 40 percent of the planned 2,500 tons U_3O_8 annual production from Yeelirrie. The remainder will go to the joint venture partners, Esso Exploration and Production Australia Pty., Ltd. (50 percent) and Urangesellschaft (ten percent). No sales contracts have been announced, but WMC has been very active in the market.

WMC has also been carrying out an intensive exploration program on its Olympic Dam copper/uranium/gold project in South Australia. An exploration shaft is being sunk to provide underground access and a bulk sample for metallurgical testing. Environmental studies are in progress. The deposit is large and it is expected that the exploration and evaluation phase will last several years.

Pancontinental Mining Ltd. (Pan Con) has started serious negotiations with local aboriginal groups for land use compensation in the form of royalties, over its Jabiluka production. Progress appears to be much slower than expected. Government development consent will not be given until full agreement is reached with the traditional land owners. Under current government marketing guidelines, Pan Con has held numerous explorative discussions with potential purchasers of uranium, but until development consent is obtained, the company is not authorized to enter into firm commitments.

Wyoming Mineral Corp., a wholly-owned subsidiary of Westinghouse Corp., sold all of its Australian uranium interest during 1981. The three named Australian defendants in the Westinghouse antitrust action, Mary Kathleen Uranium, Ltd. (MKU), Queensland Mines, Ltd. (QML) and Pan Con settled out of court with Westinghouse on the basis of sizable cash payments.

During 1981, the Uranium Enrichment Group of Australia (UEGA) completed a preliminary study into the possibility of establishing an enrichment industry in Australia. As a result, a formal feasibility study over a two-year period will be conducted. Discussions are proceeding with overseas holders of technology, particularly regarding centrifuge enrichment.

Australia concluded bilateral safeguards agreements with Sweden, France and the Euratom community this year. Negotiations with Japan, to date, have been unsuccessful, and unless a safeguards agreement is in force between these two countries, uranium deliveries under sales contracts signed after 1971 will be held up.

The 1981 outlook for uranium production in Australia ended on a positive note with an effective end to the union ban on uranium export shipment. A 16-9 vote in favor of exports at a recent Australian Council and Trade Union (ACTU) executive meeting, gave the green light to uranium shipments. The Seamen's Union, the Transport Workers and the Waterside Workers had been the only members actively supporting the previous nonbinding ACTU policy for a moratorium. Their position became more and more untenable as the Northern Territory Government took steps to make shipments via a specially built wharf on government land, and also as the Federal Court in Brisbane granted MKU an injunction against the Brisbane Waterside Unions. This all-out pressure, together with a more tolerant attitude of the Australian public towards uranium mining, has been responsible for the outcome of the union vote.

The Honeymoon uranium project is South Australia, the first in situ leach project in the country, was given development approval by the federal government during 1981. A pilot plant will be required and commercial operations will begin in 1985/1986 at 450 tons U_3O_8 per year. The Ben Lomond uranium project owned by Minatome Australia Pty., Ltd. completed its exploration tunnel and is in the process of carrying out metallurgical tests in the context of its feasibility study for the development of a mill producing 400 tons uranium per year in northern Queensland.

CANADA

New nuclear safeguard agreements were recently signed between Canada and both the European Economic Community (EEC) and Sweden. The EEC agreement was signed in Brussels, Belgium on December 18; the agreement with Sweden was signed in Ottawa on the same day.

The agreements represent a change in the Canadian government's approach to reprocessing, giving advance consent to reprocessing of Canadian origin uranium on a general rather than case-by-case basis. However, Canadian government officials do not view the agreements as representing a change in Canada's nonproliferation policy. Countries which purchase uranium from Canada are still required to adhere to International Atomic Energy Agency guidelines on nuclear nonproliferation.

1981 was an important year in the Canadian uranium industry in that several contracts were completed for the sale of Saskatchewan uranium production to US and European utility buyers. The sales represented the first truly arms-length sales of production from the new deposits in Western Canada. A few of these transactions have already been approved by the Canadian government. As anticipated, the approval process is taking about 60 days. In addition to the completed sales, US buyers are still in negotiation for long term supply of U_3O_8 from Western Canada. Some of these agreements extend ten years or more and the contractual terms are such that the sellers will profit by market improvements.

Market factors have, not surprisingly, resulted in substantially lower interest in exploration during 1981 but the development of new production facilities in Ontario and Saskatchewan continued.

In Saskatchewan, work on the Key Lake project continued in 1981 and the project received final recommendations by the Key Lake Board of Inquiry. The Board's report is expected to provide the basis for the conditions under which the project may proceed. The Key Lake project is being developed by the Saskatchewan Uranium Joint Venture, which is owned by Saskatchewan Mining Development Corp. (one-half), Uranerz Exploration and Mining Ltd. (one-third) and Eldor Resources Ltd. (one-sixth). The mining of the ore is proposed to begin in 1983 and continue at least until 1998. The project is scheduled to produce at least eight million pounds U_3O_8 per year. Reasonably assured resources have been reported at more than 150 million pounds U_3O_8.

Gulf Minerals Canada Ltd. and Uranerz continued to mine Rabbit Lake at an annual rate of about five million pounds U_3O_8. The mill at Amok Ltd.'s Cluff Lake project was completed during 1981. Mill capacity is designed for production of four million pounds U_3O_8 per year.

Eldorado Nuclear Ltd. announced December 3 that it will close its Beaverlodge mine and mill in Saskatchewan effective June, 1982. The mine has been in operation 28 years; 1981 production was about one million pounds U_3O_8. The Canadian government transferred Canada's uranium stockpile to Eldorado earlier in the year. Additionally, Eldorado's participation in the Key Lake project assures uranium supply without the unprofitable Beaverlodge facility.

Rio Algom Ltd. reported that its Panel uranium mine and mill at Elliott Lake was profitable during 1981 and operated at a high level of performance. The development of the Stanleigh project was reported to be on schedule with production expected to commence in 1983. The entire output from the project is under contract to Ontario Hydro, which is providing the financing for the project. The agreement, signed in 1978, gives Ontario Hydro the option to reduce the annual deliveries by 15 percent. The Canadian utility announced in October, 1981, that it chose to exercise that option. The contract calls for delivery of 72 million pounds which will now be extended more than the original 36 years because of the annual reductions.

Ontario Hydro also announced revisions in its contract with Denison Mines Ltd. The revised agreement calls for a nine percent reduction over the 31-year contract period and a one-year extension of deliveries (to 2010). A legal dispute over the production costs of Denison's Elliott Lake properties prompted the action.

The price for Consolidated Canadian Faraday's deliveries to AGIP Nucleare S.p.A. from the Madawaska mine was fixed at Canadian $32.75 (equivalent to about US $27.00). This price will cover the June 1, 1981 to December 31, 1982 period. Operations are expected to be marginally profitable.

Canada's uranium industry was taken by surprise during 1981 when legal charges were brought against six uranium companies. The charges contended that the international uranium cartel of the early 1970's had caused Canadian consumers, and especially Ontario Hydro, to pay more for uranium than they would have otherwise. The action is still under review.

Canada's current nuclear power plant output is 5,270 MWe, all of which is generated in the province of Ontario. 1981 showed high capacity factors for all of the generating stations. Twelve additional reactors are under construction by Ontario Hydro and the nuclear output is expected to more than double in the next ten years. Canada's 1981 total uranium demand was about 1.2 million pounds U_3O_8.

EUROPE

The effect of the Socialists' election victory on the future of **France's** nuclear power program and industry was the important question of 1981. Some of the answers are known. Five frozen nuclear plant sites were unfrozen and the government granted approval for construction

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to begin on six units in 1982 or 1983. Table 9 lists the units, all of which are scheduled to start up in 1988 or 1989.

Table 9

REACTORS RECEIVING FRENCH GOVERNMENT APPROVAL IN 1981 FOR CONSTRUCTION STARTS IN 1982 OR 1983

Reactor	Size (MWe)
Chinon	900
Nogent-sur-Seine 2	1300
Cattenom 3	1300
Chooz B1	1300
Penly 1	1300
Golfech 1	1300

France's nuclear installed capacity by the end of the year was almost 21.3 GWe. 8 new plants were connected to the grid. They are listed in Table 10.

Table 10

REACTORS CONNECTED TO THE GRID IN FRANCE IN 1981

Reactor	Size (MWe)
Blayais 1	920
Dampierre 3	900
Dampierre 4	900
Gravelines 4	920
St. Laurent B1	880
St. Laurent B2	880
Tricastin 3	900
Tricastin 4	900

By its apparent popular consultation, the government seems to have taken the steam out of the opposition to its nuclear program.

During 1981, the French government extended its control (through Cogema) over the various stages of the nuclear fuel cycle. Cogema slightly reduced its domestic uranium production and postponed the start-up of some of its overseas projects. At a time when other countries were cutting back their exploration programs, Cogema maintained its overseas exploration projects. The purchase of Pathfinder in the US is near completion; it will give Cogema a significant position in the US, adding to Cogema's already established production capabilities in France, Canada and Africa.

In the enrichment field, it is Nuexco's opinion that Eurodif's prices for separative work will soon be competitive with those of the US Department of Energy. In the area of reprocessing, France's strong position will continue under Socialist government approval.

Installed nuclear capacity in the **United Kingdom** at the end of 1981 was 6.7 GWe. While no new nuclear reactors were commissioned this year, the first reactors at Dungeness B, Hartlepool 1 and Heysham 1 have completed their fuel loading and are expected to be commissioned during the first half of 1982. These plants are among the four pairs of AGR reactors (600 MWe each) ordered by CEGB between 1965 and 1971.

For many years, an important question in the UK nuclear power field concerned the type of technology to be used in the nuclear program. AGR technology has seen the most demand, although CEGB has applied for statutory consent to construct a PWR at Sizewell. Public inquiry into the PWR system is expected to take place next year.

Forecasts of the growth of electricity demand in the UK are being revised downward. However, over the next ten years a considerable number of old plants will need to be replaced. The future role of nuclear power was aided by recently published figures by the CEGB showing nuclear power plants having a distinct advantage over coal plants in a comparison generating costs.

The first of **Spain's** 12 unit modern program, Alvarez-1, began commercial operations during 1981. The 930 MWe PWR achieved initial criticality in April and was placed in service in May. Since 1972, three units, comprising a total of 1,073 MWe, have been operating in Spain. Thus, with the addition of Alvarez-1, Spain's installed nuclear capacity at the end of 1981 was 2050 MWe. Construction work continued this year on the other eleven units, representing nearly 11 GWe. There were no new plants ordered during 1981, nor is it likely that additional plants will be ordered in 1982.

In February, Spain began to build its own nuclear fuel fabrication plant using Westinghouse and General Electric designs. Initial capacity is planned at 300 tons uranium per year beginning in 1983.

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URANIUM MARKET

Uranium production in **Portugal** totaled approximately 130 metric tons U_3O_8 in 1981. The country's producing entity, Empresa Nacional de Uranio (ENU), has plans to expand domestic production to about 460 metric tons U_3O_8 by 1985 or 1986. The decision to mine the Nisa deposit in the southeastern part of Portugal was made this year. Annual production from Nisa is expected to be about 250 metric tons of U_3O_8.

The decision regarding the Kaiseraugst nuclear plant in **Switzerland** was one of the major events during 1981 for the Swiss nuclear power program. The Kaiseraugst project received the Swiss government's preliminary approval for construction. However, the actual start of construction is contingent upon further approval by a majority of the Swiss parliament. A vote will not likely be held prior to the end of 1982. All four of Switzerland's operating nuclear plants, totaling 1,300 MWe of installed nuclear capacity, continued to perform exceedingly well during 1981.

In **Italy**, a formal announcement of the government's new nuclear power program was made during 1981 and called for six 1,000 MWe plants in operation by the early 1990s. A positive development in achieving these goals was the government's agreement to consult a larger group of people and localities on future energy programs. This includes consultation on the siting of future nuclear power plants.

Italy's Caorso plant, an 860 MWe BWR, began operation under a full power and test program license during 1981. The final full power license for routine operation will probably not be granted before the spring of 1982. In the meantime, the plant can continue to operate at full power under its current license. The Latina (200 MWe Magnox) and Caorso plants are operating extremely well, as of the end of 1981. The Trino (270 MWe PWR) and Garigliano (160 MWe BWR) plants are both down for repairs and upgrading of systems. The Trino plant may return to operation by early 1983. There is not currently a schedule for the return to operation of the Garigliano plant.

In September of 1981, the government in **Holland** formally initiated a program which will lead to a decision on whether to build more nuclear power plants. A steering committee of about five members, made up of representatives of both the pro and con sides, was set up under a "neutral" chairman. An initial information and discussion phase will last until early 1982. After several initial reports, a final report will be sent to the Dutch Parliament in late 1983. The parliament decision is expected sometime in 1984.

The two nuclear plants operating in Holland, Dodewaard (54 MWe) and Borssele (475 MWe), both operated very well during 1981. A special government committee was appointed recently to study the financial impact and consequences of closing down the Dodewaard plant. A report is expected in about six months. It is anticipated that the report will not recommend closing of the plant.

In **Finland**, the four Finnish nuclear power plants achieved new records for production during 1981. It is likely that the 1981 figures will show nuclear having produced about 35 percent of all electrical power in Finland. The TVO Unit 1 achieved an availability of over 80 percent.

Under Finland's long term policy, a new nuclear plant is being planned at the Loviisa site. Feasibility studies of both Russian and French designed reactors are underway.

In **Sweden**, two energy bills introduced in Parliament in early 1981 included a schedule for a large reduction of Sweden's oil dependence by 1990. An increased contribution from nuclear power was part of the proposed program. Sweden currently has nine nuclear power plants in operation. However, the Ringhals PWR Units 3 and 4 were removed from service during 1981 because of steam generator problems. A lengthy delay is likely before the units can be restarted. The balance of the Swedish nuclear power plants operated well during 1981. Construction continues on OKG Unit 3 and Forsmark Unit 3.

The Swedish government and industry decided not to mine the Pleutajokk uranium deposit. They concluded the project would have been uneconomical.

In **Germany**, the Grafenrheinfeld plant achieved its first criticality in December of 1981. However, the outlook for West Germany's domestic nuclear power program on the whole is not very positive. Pressures from the ecology movement have put the program at an apparent standstill.

The West German government decision not to finance the increased costs of the fast breeder reactor will most likely present a major problem for the reactor. Three utilities have agreed to put up about an additional 500 million DM for the project. This leaves about another one billion DM of uncovered costs.

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FAR EAST

While official forecasts for nuclear growth in **Japan** were scaled back during 1981, it was, in fact, a year of substantial progress for the Japanese nuclear industry. Kyushu Electric Power Co.'s 559 MWe Genkai Unit 2 was successfully brought on line in late March, bringing Japan's nuclear capacity to 15,676 MWe.

In mid-July Tokyo Electric Power Co. (TEPCO) officially announced the placing of contracts for two additional 1,100 MWe Boiling Water Reactors (BWR's). Kashiwazaki Unit 2 was awarded to Hitachi. Both units are scheduled for operation in the late 1980's.

About 10,000 MWe are currently under construction with official operating dates scheduled between 1981 and 1986. About 3,000 additional MWe have been approved by the Electric Power Resource Development Coordinating Council as part of Japan's official generating plan. Even though these units have yet to receive construction licenses, they are, nevertheless, scheduled for operation in 1985 and 1986.

Uranium market activity was, however, at a reduced level. Large uranium inventories, large, long-term forward commitments and a weakening price structure all dictated a "go slow" policy. However, discussions regarding additional long-term supply have continued, particularly with potential Australian and Canadian suppliers. Prices paid during 1981 for deliveries under existing contracts were in the range of US $37.00 to $39.00 per pound U_3O_8 and reportedly will edge lower in 1982.

In mid-1981, the **Philippines'** National Power Corp. (NAPOCOR) arranged the purchase of 622,000 pounds U_3O_8 representing the first core of its PNPP Unit 1. The uranium was delivered in December 1981 for conversion. As yet, no firm arrangements have been concluded for NAPOCOR's ongoing uranium needs of some 200,000 pounds U_3O_8 annually which, according to the unit's current schedule, will begin in 1986.

Having been successful in making its initial purchase on a spot basis and having relatively small annual needs, NAPOCOR might very well continue to buy in the spot market rather than long term.

Existing inventories and long-term contracts cover **Korea's** uranium needs until the late 1980's. A recent solicitation sent to suppliers worldwide sought offers on some 35 million pounds U_3O_8 for delivery in the period 1990 through 2000. In response to the solicitation, proposals were submitted by suppliers from Australia, Canada, Europe and the US. Korea has demonstrated itself to be an extremely price sensitive buyer, and it can be anticipated that negotiations for such large, long-term supply would be difficult and protracted.

Taiwan has two nuclear units in operation, a third expected in operation in 1982 and three more under construction. A decision on Taiwan power Co.'s Units 7 and 8 is expected in early 1982, with the French providing the principal competition to the US suppliers. Taiwan Power, with inventories of fabricated fuel and natural uranium in addition to ongoing contractual commitments with US and South African suppliers, has no unfilled requirements until the late 1980's. However, due to its international situation, Taiwan has unusual security of supply concerns. It can be anticipated that additional supply arrangements providing for deliveries as early as 1986 will be made to maintain desired inventory levels.

UNITED STATES

The failure to resolve a contract dispute between Washington Public Power Supply System (WPPSS) and Western Nuclear, Inc. has resulted in the former filing an anti-trust suit against Western Nuclear and subsequently against a number of other US producers. WPPSS seeks to have its contract with Western Nuclear declared void and unenforceable and asks for reimbursement of the monies paid under the contract. The contract in question was signed in 1975 and covered 5.5 million pounds U_3O_8 for supply to WNP-1, WNP-4 and WNP-5, with delivery beginning in 1979. At this time, a little more than half of the uranium has been delivered. In a counter claim, Western Nuclear seeks performance under the contract.

The US uranium industry in the year 1981 can be characterized by one word. Liquidation. Momentum maintained US uranium production at record high levels in 1980 despite falling prices. However, 1981 saw almost every major US producer announcing shutdowns, cut backs or delays in response to the depressed market. The only exceptions to the trend were those producers fully committed to long term contracts.

US production peaked at 42.5 million pounds U_3O_8 in 1980. Preliminary Nuexco estimates indicate a reduction to 37 million pounds in 1981. The real impact of the industry liquidation will be felt in 1982 when US production is expected to fall below 28 million

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pounds U_3O_8.

US production continued to out-strip consumption by close to a two to one margin. This caused US commercial inventories to increase from about 148 million pounds U_3O_8 at the beginning of 1981 to 162 million pounds at the end of the year. These figures include all commercial inventory not in the fabrication pipeline, including concentrates, natural UF_6 and enriched UF_6. This large inventory position continues to contribute to the depressed market. Some US utilities were active as sellers in 1981 in attempts to partially liquidate excess inventories.

The underlying problem with the US uranium market, insufficient consumption, was aggravated in 1981. Only three full power operating licenses were granted during the year. During the same period, six reactors were cancelled and twenty-one others were delayed. Table 11 itemizes the delays, cancellations and operating licenses issued in the US in 1981.

The cancellation of Hope Creek Unit 2 was especially important because the plant was 18 percent complete. Table 12 itemizes the reactors which have been cancelled in the US within the past three years. Before Hope Creek 2, the only cancellation of a unit significantly greater than one percent complete had been that of North Anna 4 in 1980, when it was 13 percent complete.

It is Nuexco's opinion that there will be additional utility decisions to cancel at least fourteen reactors due to financial and political considerations. Table 11 indicates that the six US reactors cancelled in 1981 represented a total sunk cost of more than one billion dollars. The expected costs of completing those units were much higher. Cancelling those projects will improve those utilities' financial positions in the long run, even if they are not allowed to recover the sunk costs. Reactors having a low percentage completion are, all other things being equal, more vulnerable to cancellation than others. However, the cancellations of North Anna 4 and Hope Creek 2 indicate that cancellations of units up to 20 percent complete are possible. It is Nuexco's opinion that the cancellations of units up to 40 percent complete are not out of the question.

Table 13 lists the US reactors under construction, in descending order of completion percentage. There are 17 units on the list that have completion percentages of zero. Seven others are 3 percent to 10 percent complete. Four others are 11 percent to 18 percent complete. So, 28 reactors under construction in the US fall into the high-risk category of less than 20 percent complete. Nuexco believes at least fourteen more cancellations will take place in the next few years; not necessarily all of those expected cancellations are in the high-risk category.

The election of President Reagan had sparked some hope of resurgence of nuclear power in the US. However, realists accepted that there was little that could be done directly. The utility industry still does not have the sound financial health which is the prerequisite for the recovery of the nuclear power industry. However, President Reagan's statement in support of nuclear power, issued in October, 1981, at least gave recognition to the problems besetting the nuclear industry, and the financial problems of the utilities.

It has been postulated that the length of the business cycle in the uranium industry should approximate the amount of time necessary for the nuclear industry to go through major changes in direction, which should, in turn, be no less than the lifetime of a nuclear plant construction project. In the US, this is on the order of ten to twelve years or longer.

There are numerous similarities between the current market and that of the early 1970's. The 1970 depression in uranium was broken, many think, by the nuclear industry boom in new orders in 1972-74 which brought about a market perception of increased demand in the future. A development of similar magnitude will probably be needed to bring about recovery from the current depression, and market observers continue to look for leading indicators that such a recovery will happen.

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Table 11

US NUCLEAR POWER PLANTS: 1981 SUMMARY

Full Power Operating Licenses Issued in 1981

Plant	Utility	Net MWe	Type
Salem 2	Public Service E&G	1115	PWR
Sequoyah 2	TVA	1148	PWR
McGuire 1	Duke Power Co.	1100	PWR

Cancellations in 1981

Plant	Utility	Net MWe	Type	% Complete At Cancellation	Cost (millions of $)
Bailly 1	NIPSCO	645	BWR	1	$ 200
Callaway 2	Union Electric	1150	PWR	0.5	$ 70
Shearon Harris 3	Carolina P & L	900	PWR	1	$ 187
Shearon Harris 4	Carolina P & L	900	PWR	1	for 3&4
Hope Creek 2	Public Service E&G	1070	BWR	18	$ 370
Pilgrim 2	Boston Edison	1150	PWR	0	$ 291
					$1,118

Projects Delayed in 1981*

Plant	Utility	Net MWe	Type	Delay From	Delay To	Number of Months
Allens Creek 1	Houston L&P	1200	BWR	–/88	–/91	36
Black Fox 1	PS Oklahoma	1150	BWR	7/85	7/91	72
Black Fox 2	PS Oklahoma	1150	BWR	7/88	7/94	72
Carroll County	Commonwealth Edison	1120	PWR	10/92	Indef	Indef
Carroll County	Commonwealth Edison	1120	PWR	10/93	Indef	Indef
Cherokee 1	Duke Power Co.	1280	PWR	1/90	Indef	Indef
Cherokee 2	Duke Power Co.	1280	PWR	1/93	Indef	Indef
Hartsville 1	TVA	1233	BWR	7/88	7/91	36
Hartsville 2	TVA	1233	BWR	4/89	4/92	36
Phipps Bends 1	TVA	1233	BWR	2/89	Indef	Indef
River Bend	Gulf States	940	BWR	4/84	12/85	32
South Texas Project 1	Houston L&P	1250	PWR	–/84	4/86	24
South Texas Project 2	Houston L&P	1250	PWR	–/86	4/88	24
Seabrook 2	PS New Hampshire	1150	PWR	–/85	5/86	12
Susquehanna 1	Pennsylvania P&L	1050	BWR	4/82	5/83	13
Susquehanna 2	Pennsylvania P&L	1050	BWR	4/83	5/84	13
WNP 4	WPPSS	1250	PWR	2/87	Indef	Indef
WNP 5	WPPSS	1240	PWR	12/87	Indef	Indef
Watts Bar 1	TVA	1177	PWR	11/82	1/84	14
Watts Bar 2	TVA	1177	PWR	8/83	10/84	14
Yellow Creek 1	TVA	1285	PWR	4/88	4/91	36

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*Units delayed at least one year: determined by comparing the COD listing in the December 31, 1980 Nuclear News World List of Nuclear Power Plants (published in February, 1981) with the COD listed in the June 30, 1981 list (published August 1981). Also included are delays announced in 1981 but not included in the Nuclear News list.

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Table 12

CANCELLATIONS OF US NUCLEAR PLANTS

Reactor	Utility	Net MWe	Type	% Complete At Cancellation	COD At Cancellation
1981					
Bailly N-1	NIPSCO	645	BWR	1	-/89
Callaway 2	Union Electric	1150	PWR	0.5	-/90
Harris 3	Carolina P & L	900	PWR	1	-/94
Harris 4	Carolina P & L	900	PWR	1	-/92
Hope Creek 2	PSEG	1070	BWR	18	12/89
Pilgrim 2	Boston Edison	1150	PWR	0	Indef
1980					
Davis-Besse 2	Toledo Edison	906	PWR	0-lwa	4/85
Davis-Besse 3	Toledo Edison	906	PWR	0-lwa	4/87
Erie 1	Ohio Edison	1260	PWR	0	4/86
Erie 2	Ohio Edison	1260	PWR	0	4/88
Forked River	Jersey Central	1168	PWR	5.6	5/86
Greenwood 2	Detroit Edison	1264	PWR	0	9/90
Greenwood 3	Detroit Edison	1264	PWR	0	9/92
Haven 1	Wisconsin EP	900	PWR	0	6/89
Jamesport 1	LILCO	1150	PWR	0-cp	6/89
Jamesport 2	LILCO	1150	PWR	0-cp	6/91
Montague 1	Northeast Utilities	1150	BWR	0	Indef
Montague 2	Northeast Utilities	1150	BWR	0	Indef
New Haven 1	NY States E&G	1250	PWR	0	5/93
New Haven 2	NY States E&G	1250	PWR	0	5/94
North Anna 4	VEPCO	907	PWR	13	0/92
Sterling	Rochester G & E	1150	PWR	0-cp	5/88
1979					
Palo Verde 4	Arizona PS	1270	PWR	0	5/88
Palo Verde 5	Arizona PS	1270	PWR	0	5/90
Greene County	PASNY	1200	PWR	0	7/86
NEP-1	New England Power	1150	PWR	0	Indef
NEP-2	New England Power	1150	PWR	0	Indef
Tyrone 1	Northern States Power	1100	PWR	0-cp	-/86

Table 13

US NUCLEAR REACTORS UNDER CONSTRUCTION*

Reactor	Utility	% Complete	Current Commercial Operation Date
Diablo Canyon 1	Pacific Gas & Electric Co. (PG&E)	100	/82
LaSalle 1	Commonwealth Ediaon	99	4/82
Sequoyah 2	Tennessee Valley Authority (TVA)	99	7/82
Virgil C. Summer 1	South Carolina Electric & Gas Co.	99	6/82
San Onofre 2	Southern California Edison and San Diego Gas & Electric Co.	98	6/82
Zimmer 1	Cinncinnati Gas & Light Co.	95	/82
Diablo Canyon 2	PG&E	93	8/82
McGuire 2	Duke Power Co.	92	6/83
Susquehanna 1	Pennsylvania Power & Light	91	5/83
Grand Gulf 1	Mississippi Power & Light	90	10/82
Comanche Peak 1	Texas Utilities Generating Co.	88	/82
Palo Verde 1	Arizona Public Service Co.	88	5/83
WNP 2	Washington Public Power Supply System (WPPSS)	85.8	2/84
Shoreham	Long Island Lighting Co.	85	1/83
Waterford 3	Louisiana Power & Light	85	3/83
Catawba 1	Duke Power Co.	83.4	3/84
Fermi 2	Detroit Edison Co.	83	11/81
LaSalle 2	Commonwealth Edison	82	12/82
Callaway 1	Union Electric Co.	80	4/83
San Onofre 3	Southern California Edison and San Diego Gas & Electric Co.	78	7/83
Clinton 1	Illinois Power Co.	77	8/83
Bryon 1	Commonwealth Edison Co.	76	10/83
Bellefonte 1	TVA	75	12/85
Perry 1	Cleveland Electric Illuminating Co.	75	5/84
St Lucie 2	Florida Power & Light	75	5/83
Watts Bar 1	TVA	74	1/84
Wolf Creek	Kansas Gas & Electric Co. and Kansas City Power & Light Co.	74	4/84
Midland 1	Consumers Power Co.	66	7/84
Midland 2	Consumers Power Co.	66	12/83
Limerick 1	Philadelphia Electric Co.	63	4/85
Braidwood 1	Commonwealth Edison Co.	62	10/85
Palo Verde 2	APS	61	5/84
Bryon 2	Commonwealth Edison Co.	60	10/84
South Texas Project 1	Houston Lighting & Power	60	/84
Bellefonte 2	TVA	59	9/86
Susquehanna 2	Pennsylvania Power & Light Co.	59	5/84
Watts Bar 2	TVA	58	10/84
Comanche Peak 2	Texas Utilities Generating Co.	52	/84
WNP 1	WPPSS	49.6	6/86
Braidwood 2	Commonwealth Edison Co.	48	10/86
Seabrook 1	Public Service Co. of New Hampshire	48	2/84
Shearon Harris 1	Carolina P&L	43	9/85
Beaver Valley 2	Duquesne	41.6	5/86
Perry 2	Cleveland Electric Illuminating Co.	40	5/88

URANIUM MARKET

Nine Mile Point 2	Niagara Mohawk Power Corp.	38	10/86
Millstone 3	Northeast Utilities	36	5/86
Hope Creek 1	PSEG	35	12/86
Hartsville A1	TVA	34	7/88
Catawba 2	Duke Power Co.	32	9/85
River Bend 1	Gulf States Utilities Co.	31	4/84
WNP 3	WPPSS	30.6	12/86
Limerick 2	Philadelphia Electric Co.	27.5	10/87
Phipps Bend 1	TVA	27	2/89
Hartsville A2	TVA	26	4/89
Yellow Creek 1	TVA	26	4/88
Marble Hill 1	Public Service Indiana	25	late 86
WNP 4	WPPSS	24.2	6/87
South Texas Project 2	Houston Lighting & Power	23	-/86
Grand Gulf 2	Mississippi Power & Light	22.4	9/86
Palo Verde 3	APS	21	5/86
Vogtle 1	Georgia Power Co.	18	5/85
Hartsville B1	TVA	17	Indef
WNP 5	WPPSS	13.7	12/87
Marble Hill 2	Public Service Indiana	11	late 87
Vogtle 2	Georgia Power Co.	10	11/86
North Anna 3	Virginia Electric & Power Co.	08.8	-/89
Seabrook 2	Public Service Co. of New Hampshire	08	5/86
Hartsville B2	TVA	07	Indef
Phipps Bend 2	TVA	05	Indef
Shearon Harris 2	Carolina Power & Light Coi.	03	3/88
Yellow Creek 2	TVA	03	Indef
Black Fox 1	Public Service Co. of Oklahoma	0-lwa[1]	7/91
Black Fox 2	Public Service Co. of Oklahoma	0-lwa[1]	7/94
Clinton 2	Illinois Power Co.	0-cp[2]	Indef
Allens Creek	Houston Light & Power	0	-/91
Carroll County 1	Commonwealth Edison Co. Interstate Power Company and Iowa-Illinois Gas & Electric Co.	0	Indef
Carroll County 2	Commonwealth Edison Co. Interstate Power Company and Iowa-Illinois Gas & Electric Co.	0	Indef
Cherokee 1	Duke Power Co.	0	Indef
Cherokee 2	Duke Power Co.	0	Indef
Cherokee 3	Duke Power Co.	0	Indef
Pebble Springs 1	Portland General Electric Co.	0	9/88
Pebble Springs 2	Portland General Electric Co.	0	9/90
Perkins 1	Duke Power Co.	0	Indef
Perkins 2	Duke Power Co.	0	Indef
Perkins 3	Duke Power Co.	0	Indef
River Bend 2	Gulf States Utilities Co.	0	Indef
Skagit-Hanford 1	Puget Sound Power & Light	0	-/91
Skagit-Hanford 2	Puget Sound Power & Light	0	/93

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*Information from Nuclear News World List as of June 30, 1981.

[1] Limited work authorization.

[2] Construction permit.

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MARKET DATA

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Periods* (Thousands of Pounds U_3O_8)			Remarks
	0 to 1 Year	1 to 2 Years	2 to 3 Years	
Available for Sale:				
1475	1000			UF_6
1480	300	300	300	
1490	1000			
1575			500	Long Term
1589	50	50	50	Long Term
1581	150	150	150	Long Term
1600	250	250	250	Long Term
1610	300			
1637	500	500		
1684	500			UF_6
1738	750			UF_6
1749	350	200	200	
1770	300			
1774	50			
1804	615			
1805	500	500	500	Long Term
1807	700			
1810		750		
1812A	1000			
1814	250			
1818	250	250	250	Long Term
1824	30			
TOTAL:	8845	2950	2200	
Available for Loan:				
1695	225	325	325	UF_6
1742	200			
1785	1000			
1815	1000			UF_6
TOTAL:	2425	325	325	

*Measured from the date of this Report.

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MARKET DATA

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Inquiries to Purchase:				
1410	1500	1500	1000	
1459			200	Long Term
1603			100	Long Term
1634		400		
1699	265	510	250	
1704		200	200	Long Term
1724	650	500	500	Long Term
1732	50			
1744	1000			
1769	110			UF$_6$
1771	500			
1775	20			
1806		500	250	
1834	100			
1836	55			
TOTAL:	4250	3610	2500	
Inquiries to Borrow:				
1621	300			
1780	500			
1812	1000			
TOTAL:	1800			

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*Measured from the date of this Report.

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MARKET DATA

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1451	75			
1584	350	300	300	Long Term
1607	850			
1609	500	1500	1000	
1619		250	50	
1661	200			
1684	450			
1764	100			
1840	200			
TOTAL:	2725	2050	1350	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1594	400	400	950	Long Term
1622	500	500		
TOTAL:	900	900	950	

*Measured from the date of this Report.

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MARKET DATA

CURRENT TRANSACTIONS*

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1655	83-93	2001-4000	>100	US	US	Base price escalated
1658	82	101-300	–	Europe	Canada	Loan; return in 1985
1659	82	101-300	99	Canada	Europe	
1662	81	Less than 50	98	US	US	
1663	81	Less than 50	97	US	US	
1664	81	51-100	101	Other	Europe	
1668	81	Less than 50	98	US	US	
1674	81	Less than 50	97	US	US	
1675	81	Less than 50	96	US	US	
1680	81	Less than 50	99	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks

None reported

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*Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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SUMMARY OF 1981 US URANIUM ACTIVITIES

Introduction

Uranium market activity continued to decline in 1981, resulting in a curtailment of uranium exploration and development activity. Various programs were cut back, postponed or canceled at every level as participants implemented money saving procedures. The decline in activity can be measured by the decrease in footage drilled during the year. Nuexco estimates that exploration and development drilling for 1981 will total between 13 and 14 million feet, a decrease of about 50 percent from the 1980 total of 28 million feet. Expenditures related directly to exploration and development drilling should total $70 to $80 million, 40 to 50 percent below the 1980 level.

In general, 1981 exploration activity was limited to fulfillment of property commitments. The acquisition of new properties was minimized and many existing property positions were reduced in size or canceled altogether. New exploration was limited to a few highly potential projects. Plans to develop new conventional projects were postponed indefinitely or canceled, while certain developing projects were terminated with contingent plans to resume development when market conditions become more favorable. Mine and mill production has likewise been curtailed or shut down.

It is noteworthy that the market decline has subsequently influenced the availability of reasonably assured uranium resources in the US. An assessment of reserves in a forward cost category of $25 per pound U_3O_8 was made by Nuexco in July 1981 (Nuexco Report 155) based on annual reserve figures released by USDOE on May 13, 1981. According to the DOE estimate, total reasonably assured resources (RAR) in the cost category up to $30 was reduced to 426,000 tonnes U_3O_8, down from 585,000 tonnes in 1980. The Nuexco estimate of RAR at the market level of $25 per pound indicated a further reduction to 317,000 tonnes, representing a decrease of 46 percent from the $30 per pound U_3O_8 listed in the January 1, 1980 estimate by DOE.

As anticipated in Report 155, total RAR has been further downgraded as a result of declining market values. Nuexco now estimates that RAR available at the present market level of $23.50 totals approximately 298,000 tonnes U_3O_8. The reduction of 19,000 tonnes since July 1981 represents a six percent loss in RAR. However, while the market level has been stable at $23.50 per pound U_3O_8 for the past five months, forward costs for mine and mill operations have continued to escalate due to inflation. By applying a flat inflation rate of ten percent, RAR would be reduced to 266,000 tonnes, down 51,000 tonnes from Nuexco's July total of 317,000 tonnes.

RAR considered available to the uranium industry will continue to follow the pattern set by the market price trend. In terms of real dollars, further reductions are predictable in today's market environment, a situation that will continue to deter new exploration and development projects.

Exploration Activity

The highlight of 1981 US exploration activity was the January 13 announcement of Wyoming Fuel, a wholly-owned subsidiary of Kansas/Nebraska Natural Gas Co., that a "significant" uranium occurrence had been discovered near the town of Crawford in the extreme northwest corner of Nebraska. Mineralization occurs in the basal units of the White River Formation of the Tertiary Age. Wyoming Fuel owns a 50 percent interest in the 64,000 acre property; the remaining 50 percent is controlled by Ferret Exploration of Denver. The area of mineralization is referred to as the Crow Butte Project by the joint venture.

The announcement claimed that project activity was in a "very preliminary" phase. However, results of drilling indicated a potential ore reserve at more than 25 million pounds U_3O_8. At least 62 of the first 400 holes drilled in the prospect area showed important uranium mineralization at various thicknesses, grades and depth. In fact, 28 drill holes showed five feet or more of ore containing at least 0.10 percent uranium. A portion of the deposit is shallow enough to allow surface mining; the rest is deep enough to consider recovery by solution mining methods.

Evaluation of the deposit has continued throughout 1981. Several hundred additional holes were drilled within the ore zone to confirm ore grade, thickness and continuity. Results of the fill-in drilling are considered extremely successful. It is probable that by the end of the present evaluation phase, the reserve status will be upgraded in total pounds and reclassified into measured and indicated reserve categories. The next evaluation phase will include feasibility studies to determine the recovery method most suitable for the orebody, and timing of full-scale development.

The South Texas district remains the most active within the US for the second consecutive year. As of mid-December, 55 drill rigs were operating in the district, compared to six in the Grants Uranium Belt of

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New Mexico, and a total of 40 in all other districts. Rocky Mountain Energy is the most recent participant in the South Texas area, where 20 to 25 companies still compete for property position.

The main area of activity in South Texas extends from Karnes County in the north to the south line of Duval County. Exploration is concentrated on the up-dip and down-dip extension of ore-bearing fluvial channels that trend down to the coast, cutting the strike of the formations at right angles. There are at least eight known channels within the three county (Karnes, Live Oak and Duval) area, all of which have multiple mineralized zones, primarily in the Oakville and Catahoula formations. Almost all uranium production from the district (18,400 tonnes U_3O_8) has been mined from deposits occurring in the eight channels that developed in Tertiary rocks.

Exploration in South Texas is not restricted to the area described above. It is scattered from the Mexican border northeastward to the vicinity of Houston, approximately 350 miles. A few small ore occurrences have been discovered, and in some cases evaluation is continuing on a limited scale. The new discoveries are associated with fluvial channels or offshore bars, neither of which has been fully explored. Five to seven new channels have been discovered and the potential for additional channels is considered to be favorable, one reason for continued interest by exploration groups.

During mid-1981, Texaco Inc. acquired a three-year option on about 53,000 acres in the Powder River Basin, Wyoming. It is the company's first major uranium program in Wyoming. Previously, exploration was limited to Texas and one or two other states on a smaller scale. Several uranium occurrences had already been discovered on the Wyoming property prior to the Texaco option. It is assumed that Texaco will explore each deposit further as part of the total project evaluation.

Exploration is continuing for the third straight year in southern Virginia. Marline Uranium Corp., a subsidiary of Marline Oil Corp., Calgary, Alberta, Canada, has over 50,000 acres under lease for uranium exploration. Most of the acreage and exploration activity is in Pittsylvania County, but work is progressing in several other counties and in North Carolina as well. More than 150 holes have been drilled to an average depth of 600 feet in the vicinity of favorable Triassic basins. Marline reports that the project has favorable public support and exploration is continuing on an indefinite schedule.

Other US exploration projects are primarily concentrated in the general vicinity of existing major producing districts. While different projects have met with limited success, important discoveries of high-grade, large tonnage deposits have not been made. In lieu of making a high-grade discovery, a number of exploration groups are looking for uranium deposits which can be produced at competitive cost levels. Solution mining seems to offer such an opportunity and is another attraction of the South Texas district.

Development Activity

The February start of operations by Union Oil Co. at the Sweetwater Uranium Project in Wyoming climaxed a long development period. The project is the newest conventional production facility in the US and its start-up was a significant 1981 event. The mine and mill are designed to handle at least 3,000 tons of ore per day making it one of the largest operations in Wyoming at this time.

In August, the start-up of an in situ leach operation in the same general area was announced by Ogle Petroluem Inc. Ogle is scheduled to recover 300,000 to 400,000 pounds U_3O_8 annually from its Bison Basin operation. Western Fuel, Inc., a subsidiary of Duke Power Co. of Charlotte, North Carolina owns a 50 percent interest in the project.

Several new recovery centers were completed in the South Texas district, including Tenneco's 200,000 pound per year West Cole plant in Webb County and Conoco Inc.'s 450,000 pound per year Trevino plant in neighboring Duval County. In another producing area, Freeport-McMoRan Inc. initiated production in May at a new uranium recovery facility near Donaldsonville, Louisiana. The plant is designed to recover 420,000 pounds U_3O_8 per year as a by-product of phosphoric acid.

Another positive 1981 uranium development was the approval by the state of Colorado of Homestake Mining Co.'s application for a reclamation permit to build a 600 ton per day uranium mill at its Pitch Project near Gunnison, Colorado. According to the February announcement, the mill is scheduled to begin operating in late 1982.

Following in March was the announcement that Conoco had applied to the New Mexico state Engineer for permission to appropriate underground water for a proposed 1,300 ton per day uranium mill to be located near Prewitt. The mill feed is to be mined from a depth of 2,200 feet at Crownpount, 22 miles north of the mill. The project is jointly owned by Conoco and Wyoming

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Mineral Corp., a subsidiary of Westinghouse Electric Corp.

Both the Homestake and Conoco projects were postponed a few weeks after the original announcements had been made. In fact, many announcements of project postponements, curtailments or cancellations were forthcoming from every quarter of the industry. The most important events having an impact on the US uranium industry are listed chronologically in Table 14.

A number of similar events have affected the smaller mine operators with more devastating consequences. Less than ten companies are currently operating in the Utah/Colorado area of the Colorado Plateau where about 150 were active two years ago. Overall, new mine and mill development programs are on hold or have been postponed indefinitely in response to the current U_3O_8 supply/demand situation. In all probability, the attitude of potential developers will remain the same unless favorable changes occur in the supply/demand area. Nuexco anticipates that US production will continue to decline during the next few years with an annual total of about 20 million pounds U_3O_8 by 1984 (Report 158, Table 1).

Table 14

1981 US URANIUM DEVELOPMENTS

Date	Company	Event
1/81	Western Nuclear, Inc.	Reduced production by 40 percent at the Split Rock mill near Jeffrey City, Wyoming.
1/81	Conoco, Inc./Pioneer Nuclear Corp.	Cut back 50 percent of Conquista mine and mill operations near Falls City, Texas.
1/81	Cotter Corp.	Cut back one-third on milling operations at Canon City, Colorado; the Schwartzwalder mine in Colorado and two Utah mines to continue operating.
2/81	Federal American Partners	Shut down Gas Hills, Wyoming mining operations. Mill to continue to run on stockpiled ore.
3/81	Union Carbide Corp.	Closed Uravan mill in southwest Colorado for at least six months. Curtailed mine operations at all mines in district.
3/81	Conoco, Inc./Wyoming Mineral Corp.	Stopped development work at Crown Point mine.
3/81	Wyoming Mineral Corp.	Will close Irigaray, Wyoming in-situ mining project indefinitely.
3/81	Cotter Corp.	Suspending development of JD7 mine in Colorado.
4/81	Cleveland Cliffs Iron Co.	Postponed the construction of a commercial mine and mill at Pumpkin Buttes, Wyoming.
4/81	Exxon Nuclear Corp.	Cut back Highland mill production by one-third; open pit operations cut to one half annual rate with underground mine to be phased out by early 1982.
4/81	Pioneer Uravan, Inc.	Closing four of five small Colorado Plateau mines; seeking permits for 1,000 ton per day mill near Slick Rock, Colorado.

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4/81	Homestake Mining Co.	Indefinitely delaying construction of 600 ton per day mill at the Pitch mine; will phase down open pit operations from three to one shift per day.
5/81	Sohio Western Mining Co.	Closed Seboyeta, New Mexico mill.
6/81	Sohio Western Mining Co.	Announced closing of Seboyeta mine.
6/81	Western Nuclear, Inc.	Will close the Split Rock mill; 30,000 pounds U_3O_8 will be recovered annually from mine discharge water; mines put on standby.
6/81	Wyoming Mineral Corp.	Placed all Wyoming operations on standby.
6/81	Ranchers Exploration Corp.	Closed the Hope mine in Ambrosia Lake district.
7/81	Phillips Petroleum Co.	Nose Rock project put on standby.
7/81	Conoco, Inc. Pioneer Nuclear Corp.	Complete shutdown of Conquista project in early 1982.
7/81	Petrotomics (Getty Oil Co.)	Will cut production at Shirley Basin by 50 percent to 750 tons U_3O_8 per year.
8/81	Amoco Minerals Co.	Suspended all uranium exploration.
9/81	Homestake Mining Co.	Cut back its Grants mill operation by one-third; closed one mine.
9/81	Union Carbide Corp.	Uravan mill to start operation and continue six months.
9/81	Federal American Partners	Closed the mill at Gas Hills, Wyoming.
10/81	Rio Algom Corp.	Reduced production at its Lisbon, Utah project by 50 percent.
10/81	Anaconda Co.	Will cease all mining and milling operations in the Grants, New Mexico district by 3/82.
10/81	Wyoming Mineral Corp.	All uranium properties put up for sale.
11/81	Ranchers Exploration Corp.	May close the Jonny M mine in Ambrosia Lake, New Mexico by 6/82.
12/81	Gulf Mineral Resource Co.	Will cut back on Mt. Taylor, New Mexico production by about 20 percent.
12/81	Pathfinder Mines Corp.	Negotiating to sell 80 percent of Gas Hills, Wyoming operation to Cogema of France.
12/81	Plateau Resources	To start up Shootering Canyon mill in spring of 1982.

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STATISTICAL DATA

EXCHANGE VALUE $23.50/lb. U_3O_8
Determined as of December 31, 1981

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

TRANSACTION VALUE
Determined as of December 31, 1981

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
24.00	2.5	18	4

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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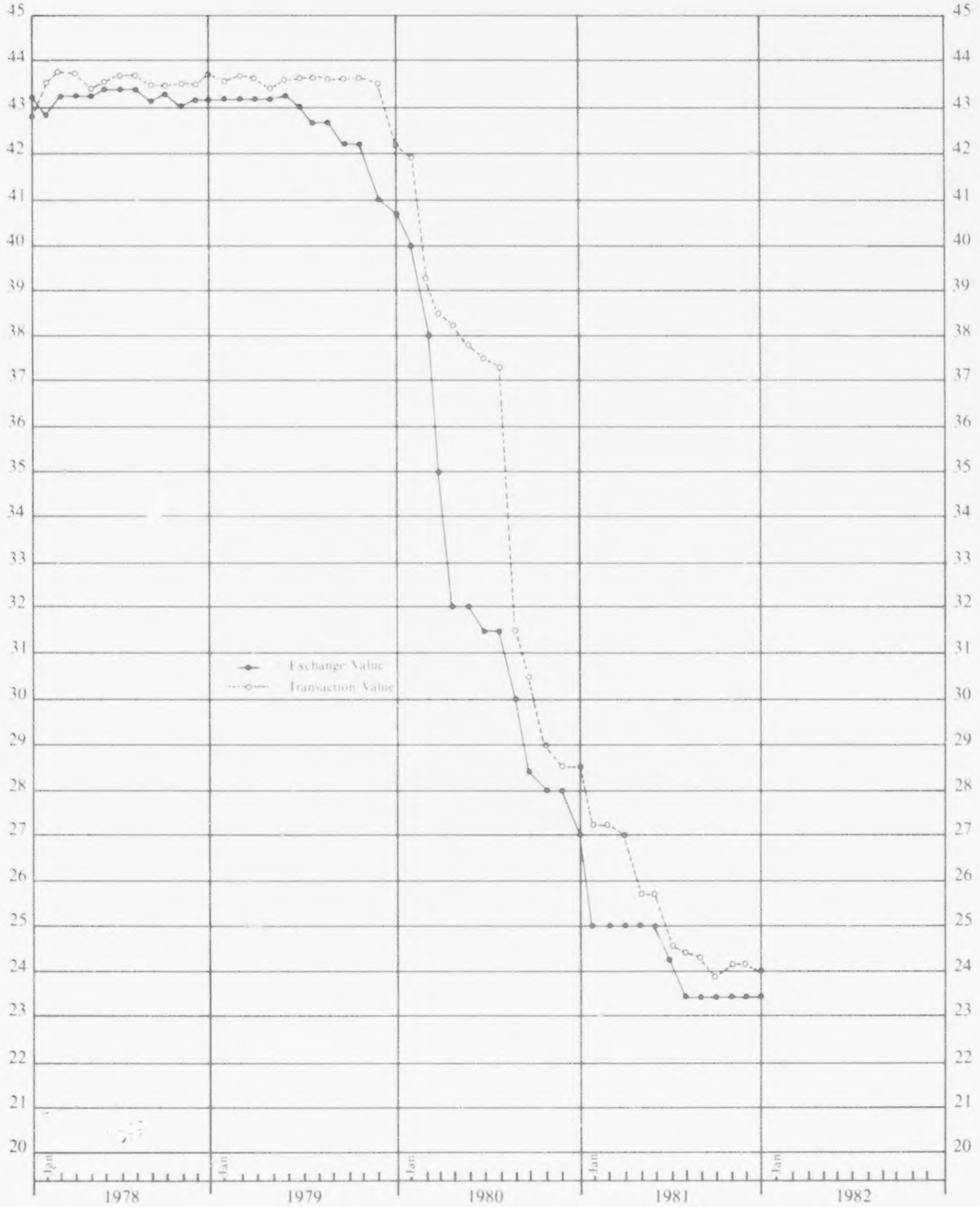
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES*

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	23.50	51.81	61.09
France (franc)	134.36	296.22	349.31
FRG (mark)	52.81	116.42	137.29
Japan (yen)	5,160	11,376	13,416
Switzerland (franc)	42.30	93.26	109.98
UK (pound)	12.29	27.10	31.95
Australia (dollar)	20.82	45.91	54.14
Canada (dollar)	27.85	61.40	72.40
Niger, Gabon (CFA)	6,714	14,802	17,456
South Africa (rand)	22.60	49.82	58.74
Sweden (kröner)	130.92	288.63	340.36

*Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

TRANSACTION VALUE

Determined as of the last day of the month indicated
(US Dollars/lb. U_3O_8)

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

Month	Report No.	$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
1976					
May	094	39.60	2.1	16	3
June	095	39.70	2.6	17	3
July	096	39.70	2.1	11	3
August	097	40.40	2.2	10	3
September	098	40.30	2.2	10	3
October	099	40.60	2.3	10	3
November	100	40.70	2.1	12	3
December	101	40.70	2.3	14	4
1977					
January	102	41.30	2.0	12	3
February	103	41.30	2.3	15	4
March	104	41.40	2.1	16	4
April	105	41.50	2.0	15	5
May	106	42.80	2.7	11	3
June	107	42.90	2.8	13	3
July	108	43.00	2.7	13	3
August	109	42.60	2.0	11	3
September	110	42.50	2.4	12	4
October	111	42.80	2.1	11	4
November	112	42.90	2.1	11	5
December	113	42.90	2.0	11	6
1978					
January	114	43.10	2.3	10	6
February	115	43.30	2.2	10	5
March	116	43.70	3.1	13	3
April	117	43.60	3.3	14	3
May	118	43.60	3.5	13	3
June	119	43.20	2.4	10	3
July	120	43.30	2.8	10	4
August	121	43.40	2.7	10	4
September	122	43.40	2.8	11	5
October	123	43.60	2.7	11	6
November	124	43.40	2.1	13	4
December	125	43.70	2.3	14	3

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STATISTICAL DATA

1979					
January	126	43.60	3.4	17	3
February	127	43.80	2.5	10	3
March	128	43.70	3.1	11	4
April	129	43.40	2.2	10	4
May	130	43.60	3.2	12	5
June	131	43.70	2.1	11	4
July	132	43.70	2.1	12	3
August	133	43.60	2.5	14	4
September	134	43.60	2.5	15	5
October	135	43.60	2.5	15	6
November	136	43.50	2.7	17	7
December	137	42.30	2.1	13	6
1980					
January	138	42.00	2.3	14	7
February	139	39.30	4.0	12	3
March	140	38.60	3.6	11	3
April	141	38.40	3.6	13	3
May	142	37.90	3.9	14	4
June	143	37.60	4.1	17	5
July	144	37.30	4.3	19	6
August	145	31.60	2.4	17	5
September	146	30.60	2.0	15	4
October	147	29.00	3.2	14	3
November	148	28.70	2.9	16	4
December	149	27.70	2.7	10	4
1981					
January	150	27.20	3.1	10	4
February	151	27.20	3.1	10	5
March	152	27.00	3.3	11	6
April	153	25.70	2.9	11	6
May	154	25.70	2.9	12	7
June	155	24.50	2.9	10	6
July	156	24.40	2.9	10	5
August	157	24.30	2.6	10	5
September	158	23.90	2.8	11	4
October	159	24.10	2.1	10	3
November	160	24.10	2.1	10	3
December	161	24.00	2.5	18	4

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of December 31, 1981

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.

B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE 6%
Determined as of December 31, 1981

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.

B. Rates included in firm proposals to borrow or lend.

C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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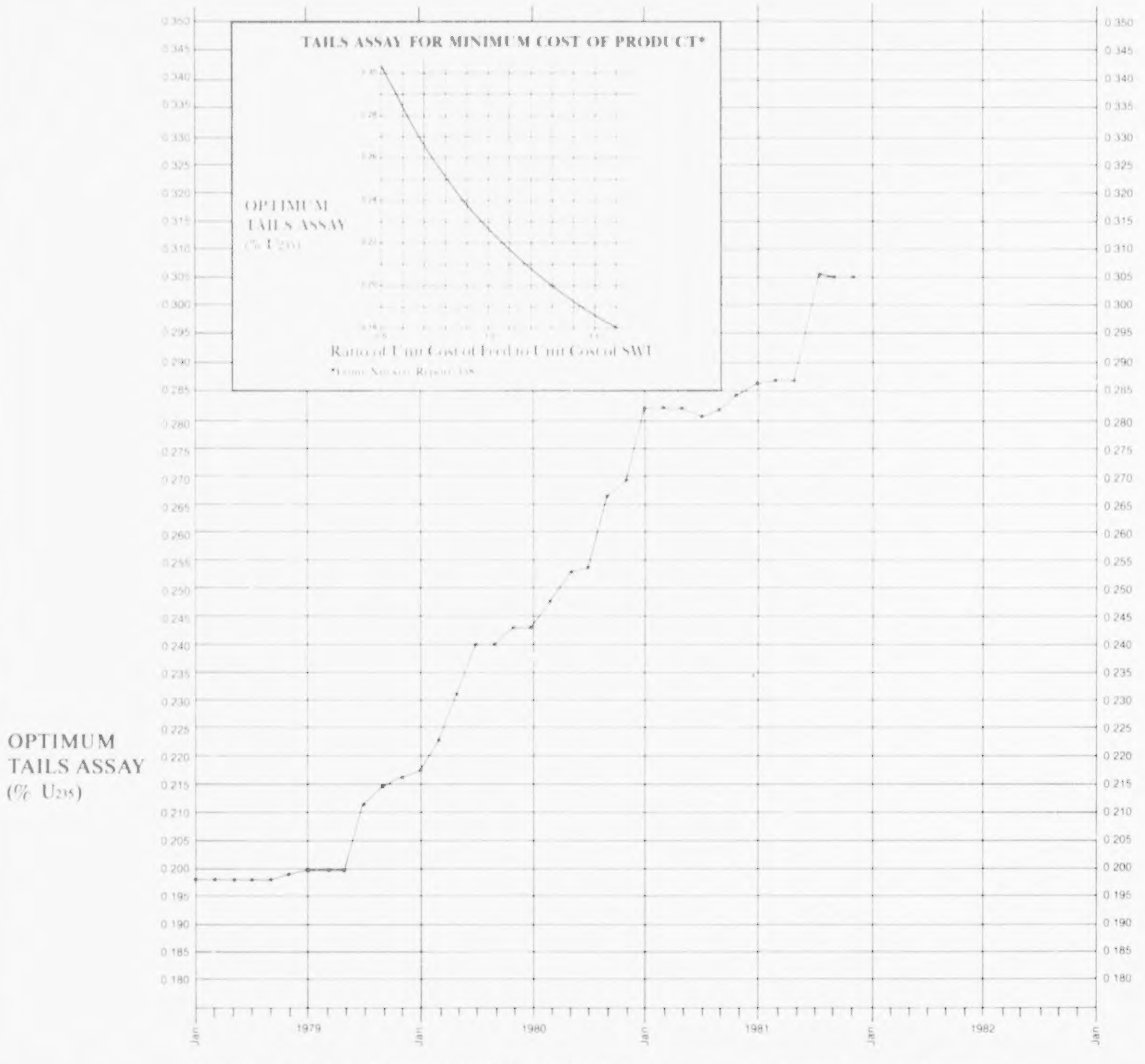
STATISTICAL DATA

OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1970[5]	110.0	110.4	116.3	91.36	3.88	3.87	3.69	3.28
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Jan 1981	291.5	284.8	260.5	—	10.91	11.31	8.74	7.41
Feb 1981	295.7	287.6	263.2	—	11.15	11.36	8.80	7.43
Mar 1981	299.6	290.3	265.1	188.14	11.13	11.50	8.84	7.47
Apr 1981	303.5	293.4	266.8	—	11.30	11.63	8.94	7.51
May 1981	304.7	294.1	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1	294.8	271.3	191.06	11.31	11.88	9.07	7.50R
Jul 1981	306.2R	296.2R	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.0P	296.2P	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	307.2P	295.5P	279.3	195.61R	12.11P	12.68R	9.38	7.79
Oct 1981	308.8P	296.0P	279.9	—	12.12P	12.46P	9.34P	7.84P
Nov 1981	309.1P	295.5P	280.7		—	—	9.34P	7.87P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.: Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNMP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1970[3]	101.4	59.88
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.01R
Aug 1980	352.0	220.08
Sep 1980	350.3	219.60
Oct 1980	348.2	221.13
Nov 1980	350.4	221.50
Dec 1980	351.7	222.41R
Jan 1981	357.8	230.58R
Feb 1981	356.6	230.41R
Mar 1981	355.2	229.66R
Apr 1981	354.6	229.38R
May 1981	353.4	237.31R
Jun 1981	360.4	237.31R
Jul 1981	357.5	237.62R
Aug 1981	360.3	237.48R
Sep 1981	357.8	237.45P
Oct 1981	352.0P	238.73P

P = Preliminary R = Revised since last month

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[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1, 2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3, 4]		
		Metal Mining, including milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Aug 1980	249.4	10.58	8.14	8.65
Sep 1980	252.0	10.85	8.24	8.71
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.8	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3	11.27	8.51	8.90
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.5R	11.47	8.63	9.17
Apr 1981	267.9R	11.73	8.76	9.33
May 1981	269.9R	11.80	8.90	9.49
Jun 1981	272.2R	11.80	9.16R	9.57R
Jul 1981	274.2R	11.92	9.20	9.62R
Aug 1981	276.0R	11.82P	9.16P	9.64P
Sep 1981	276.6R	12.39P	9.24P	9.82P
Oct 1981	278.3P	—	—	—

P = Preliminary   R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1970[3]	7.34	100.3[4]	—	655,346	399,164
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3, 6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3, 6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3, 6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Jul 1980	—	177.2	192.7	715,460	202,403
Aug 1980		179.2	196.8	716,486	206,514
Sep 1980	36.19	182.8	199.8	710,889	204,761
Oct 1980	—	186.3	203.1	720,246	204,602
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981		196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	—	227.0	760,788	273,880
Oct 1981	—	—	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.
[2] Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."
[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
[4] April 1970 = 100.00.
[5] Bulletin of Statistics, Department of Statistics, Pretoria.
[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Co., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas

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EXECUTIVE SUMMARY
NUEXCO REPORT 161

1981 In Review

The 1981 uranium market and the year's important events are highlighted in this month's year end review.

Exchange Value Remains at $23.50

The **Exchange Value** as of December 31, 1981 is $23.50 per pound U_3O_8, unchanged from the five previous months. Although early December saw a continued price firming, new weakness developed towards month end. Several transactions involving a total of nearly two million pounds U_3O_8 are under discussion at prices near the current Exchange Value.

Near Term Supply and Demand Still at Two To One Ratio

As indicated in the *Market Data* section, the total of material available for sale in the near term is about 8.8 million pounds U_3O_8 equivalent. The total of demand in the same time frame is about 4.2 million pounds U_3O_8 equivalent.

Transaction Value Decreases Ten Cents to $24.00; Nine Uranium Sales Reported

This month's **Transaction Value** includes eighteen transactions totaling 2.5 million pounds U_3O_8 and covering four months. Nine uranium sales and one uranium loan transaction are reported this month. Seven of the nine sales are for relatively small quantities and all are for spot or near term delivery.

Conversion Value $1.20, Unchanged

The **Conversion Value** remained at $1.20 per pound U as UF_6. No conversion transactions are reported this month. The secondary conversion market was relatively quiet in December as it has been over recent months.

Canada Signs New Safeguards Agreements

New nuclear safeguards agreements were signed during December between Canada and both the EEC and Sweden. The agreements give advance consent to reprocessing of Canadian origin uranium on a general rather than case-by-case basis.

WPPSS Files Anti-Trust Suit

The failure to resolve a contract dispute between Washington Public Power Supply System and Western Nuclear, Inc. has resulted in WPPSS filing an anti-trust suit against Western Nuclear. The contract in question was signed in 1975 and involves 5.5 million pounds U_3O_8.

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NUEXCO

FEBRUARY 1982 **NUMBER 162**

Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

February 1982 No. 162

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URANIUM MARKET

PRICING

The **Exchange Value** as of January 31, 1982 is $23.00 per pound U_3O_8, a drop of fifty cents from the $23.50 level that held for the past six months. This decrease reflects the following factors:

1. Recent transactions concluded at lower price levels.
2. Lower prices being negotiated in pending transactions.
3. An increase in the amount of material available for sale in the near term.
4. Buyers' and sellers' perceptions that recent cancellations and deferrals of reactors will make available, for sale in the near term, additional large quantities of inventory.

Aware of these developments and sensing a weakening market, buyers became increasingly selective, particularly in the spot and near-term markets. Some buyers who had been active in the market delayed their purchasing, presumably until the downward momentum slows. At the same time, sellers trying to anticipate the trend entered the market with substantial quantities of material. The *Market Data* section of this Report indicates that material available for sale in the spot and near-term market (deliveries completed within one year) totals 10.1 million pounds U_3O_8 while uranium demand for the same time period totals 4.0 million pounds U_3O_8.

Any strengthening of prices in the spot market in either current or constant dollars, must await clearing of the inventory overhang that already exists. If, as expected, the inventory overhang worsens, it will exert even more persistent downward pressure on prices in the spot and near-term markets. However, prices in the spot and near-term markets are diverging from those of the intermediate and long-term markets. Utility invitations for five- to ten-year supplies (typically beginning in the 1983-1985 time period) are unlikely to evoke sales offers at prices related to current spot market levels. To the extent that the price differential exceeds inventory carrying costs, it is possible, as in the past, that some buyers may elect to buy and hold inventory as opposed to contracting longer term. Such early procurement would, of course, tend to strengthen spot prices.

The **Transaction Value** as of January 31, 1982 is $24.00 per pound U_3O_8, unchanged from last month. This month's Transaction Value includes twenty transactions totaling 2.8 million pounds U_3O_8 and covers a period of five months.

There are three uranium sales transactions reported this month:

1. A US firm sold between 100 thousand and 300 thousand pounds U_3O_8 to a US intermediary firm for delivery in the first half of this year.
2. A US producer sold 100 thousand to 300 thousand pounds U_3O_8 to a US firm, with delivery taking place in 1982.
3. A US utility sold 100 thousand to 300 thousand pounds U_3O_8 to another US utility, for delivery this year.

In the secondary conversion market, one US utility sold between 300 thousand and 600 thousand pounds U as UF_6 to another US utility. Delivery is to take place in the first half of this year.

The **Loan Use Charge Rate** remained at six percent. The *Statistical Data* section of this Report contains a table listing the Loan Use Charge Rate for all past Nuexco Reports.

The **Conversion Value** as of January 31, 1982 is $1.20 per pound U as UF_6, unchanged from last month. The secondary market for conversion services was quiet during January. One transaction closed at a price approximately equal to Conversion Value.

1981 Transactions

During 1981, Nuexco reported 52 uranium sales transactions; they involved a total of 54.4 million pounds U_3O_8 equivalent. Of that amount, 46.2 million pounds U_3O_8 were included in intermediate or long-term transactions (deliveries more than one year into the future). During 1981, Nuexco reported seven transactions that used some form of a market-related pricing mechanism; they involved a total of 10.4 million pounds U_3O_8. The annual totals of all transactions are tabulated below in Table 1.

Table 1

1981 TRANSACTIONS REPORTED BY NUEXCO, TOTALS BY YEAR (millions of pounds U_3O_8)

Year	Amount	Year	Amount
1981	6.2	1986	5.0
1982	2.9	1987	3.6
1983	3.7	1988	3.4
1984	4.8	1989	2.7
1985	3.7	1990+	18.4

Thirty of the transactions reported by Nuexco during 1981 met the tests for inclusion in one or more of the

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Transaction Value calculations. Those transactions involved a total of 5.6 million pounds. The weighted average of prices paid in those thirty transactions equals $24.35.

It is important to note that the weighted average mentioned here is not an average of Transaction Values. Some 1980 transactions were included in some of the early 1981 Transaction Values. Also, not all transactions are included the same number of times during the year; some might be in only three Transaction Value calculations and others might be included in four to six, depending on how many pounds are necessary to meet the minimum of two million pounds for each Transaction Value.

AFRICA

In a year end review of the uranium market, Messrs. G. Langton and D.A. Etheredge, senior officials of Anglo-American, commented as follows:

"The uranium market continued to weaken during the year. This was partly a result of the ongoing enforced inventory liquidation by US electric utility companies in a market already weakened by perceptions of projected oversupply.

"As a result, a number of higher-cost uranium producers, particularly in the US, which represented a significant proportion of world production, have become uneconomic and been forced to curtail or cease their operations. In addition, a number of new projects have been deferred or canceled. It will require a considerable price increase before these production facilities will be utilized.

"Nevertheless, despite the consequent shortening of the period until projected supply and consumption are again in balance, lead times for new nuclear reactors remain long and it will probably be several years before any real price improvement is seen."

The tone of their comments is interesting when compared with the more optimistic views offered by other officials, particularly those associated with prospective entrants into the uranium business. They typically see a resurgence of nuclear power leading to excellent market prospects.

Final 1981 uranium production figures from South African gold-uranium operations (members of the Chamber of Mines) were released this month and are presented in Table 2. It also presents the corresponding figures for each quarter of the year.

Table 2

REPUBLIC OF SOUTH AFRICA:
1981 URANIUM PRODUCTION FROM GOLD-URANIUM OPERATIONS

(thousands of pounds U_3O_8)

Operation	1Q81	2Q81	3Q81	4Q81	Total
Blyvooruitzicht	178	188	173	157	696
Buffelsfontein	339	363	337	354	1,393
CHEMWES	380	363	372	358	1,473
ERGO	162	181	168	155	666
Harmony	308	323	336	312	1,279
Hartebeestfontein	304	269	241	241	1,055
J.M.S.	609	584	603	614	2,410
Randfontein	361	325	341	278	1,305
Vaal Reefs	993	923	957	860	3,733
West Dreifontein	135	131	141	127	534
West Rand Consolidated	188	179	53	64	484
Western Deep Levels	108	130	130	101	469
TOTAL	4,065	3,959	3,852	3,621	15,497

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Some observations about the figures in Table 1 and about 1981 uranium operations:

1. Fourth quarter production was approximately eight percent less than that of the third quarter.
2. 1981 production was approximately two percent less than that of 1980.
3. Production at Randfontein's millsite uranium plant ceased during the fourth quarter.
4. Commissioning of the new Western Areas uranium plant began during December and initial production took place during January.
5. Table 1 includes all of South Africa's uranium production except that of Palabora, which is not a member of the Chamber of Mines. That figure is scheduled to be released in a few months.
6. The Beisa Mines section of St. Helena commenced stoping operations during September; limited quantities of uranium and gold have been recovered to date.

AUSTRALIA

Pancontinental Mining Ltd. resumed its negotiations with the Northern Land Council after a holiday break. The current round of talks is based on agreements reached between Pan Con and the Aboriginal representatives during previous discussions. It is understood that many of the outstanding issues are being resolved in favor of the traditional owners. The outcome of these negotiations will indicate the terms under which other uranium developments on Aboriginal land in the Northern Territory will proceed, especially Denison Mines' Koongarra deposit.

Following the completion of environmental procedures and compliance with Australia's foreign investment policy, the federal government approved the development of the Lake Way uranium project in Western Australia. Lake Way is a joint venture between Vam Ltd., an oil and gas producer (46.5 percent), and Delhi Petroleum Pty., Ltd. (53.5 percent), a wholly-owned subsidiary of CSR, Ltd. CSR controls the Honeymoon project in South Australia and holds significant exploration lands north of the Nabarlek uranium mill site. CSR is also a member of the Uranium Enrichment Group of Australia (UEGA). Having received development approval, the Lake Way partners are now entitled to seek ministerial authority to negotiate sales contracts.

After three and a half years of negotiations, officials of the Australian and Japanese governments initialled a bilateral safeguards agreement during January. Japan regards the agreement with Australia as significant, inasmuch as it will form the basis of Japan's upcoming negotiations with the US and Canada.

The safeguards package must be ratified in Japan by the Diet, but it is not subject to Parliament approval in Australia. Japanese reports claim that Japan has obtained important concessions from Australia:

1. Waiver of the requirements for prior approval by Australia for the transfer of nuclear material to third countries.
2. Removal of the requirement for prior approval to reprocess Australian uranium. It would be replaced by a requirement to notify the Australian government of the plants where the uranium will be reprocessed.
3. Waiver of the requirement of prior approval for enrichment above 20 percent U_{235}.

The Australian government, however, has denied Japanese reports of the concessions. Resolution of the conflicting versions must await the publication of the safeguards package.

Australia has also reached agreement with Switzerland on the text of the bilateral agreement between the two countries. Ratification by the parliaments of both sides is anticipated in 1982. Unlike the Japanese, the Swiss do not currently hold supply contracts for Australian uranium, so ratification of the agreement is not a pressing matter.

UEGA's selection of an enrichment technology, expected by the end of 1981, has been postponed until March or April of 1982 due to a last-minute decision by the US government to make its gas centrifuge technology available to Australia. UEGA plans to commence a full feasibility study, at a cost of $5 million, on the establishment of a uranium enrichment industry in Australia immediately following the technology selection. The feasibility study will take two years to complete.

Until the decision is made, UEGA will evaluate the centrifuge technologies of Japan, Urenco, and the US, along with the French chemical exchange technology. Unofficial reports indicate that UEGA favors Urenco as a technology partner for several reasons:

1. Urenco's proven technology is probably cheaper than the alternatives.
2. Local manufacturing of centrifuges will be allowed.
3. Urenco has developed a strong relationship with

UEGA over the past two years.

4. Urenco centrifuges are smaller and easier to build than the US equivalent.

5. Japanese technology is still in the pilot stage.

Regardless of the choice of technology, it is likely that UEGA will seek both French and Japanese participation to encourage the involvement of major consumer nations in the project. Plant size is still tentative. It will ultimately depend on market commitments, but figures of 1-3 million SWU per year are being considered. UEGA will almost certainly take a modular approach to capacity additions.

After selecting the technology, the most important decision will be the siting of the plant. In addition to the Northern Territory, Western Australia, South Australia and Queensland are potential contenders. At this juncture, conditions seem to favor a South Australian site, but the situation is quite fluid. To generate a favorable climate for the enrichment industry in that state, the South Australian government is participating in a study by two local companies in conjunction with British Nuclear Fuels, to determine the feasibility of an independent conversion plant in South Australia. This study proceeds in parallel with, and independent of, any efforts which UEGA is undertaking concerning UF_6 conversion.

The overlapping spheres of responsibility between government (federal and state) and industry create a complex web of political and commercial demands which the decision process of the feasibility study will seek to satisfy. The study will continue through 1984. Taking into account present market conditions and the absence of licensing procedures in Australia, a commitment to construction could hardly emerge before 1986; consequently, operations could hardly commence before 1990.

CANADA

Now that a half-dozen or so new uranium sales contracts have been approved by the Canadian Uranium Export Review Panel, it is possible to piece together what appears to be some of the current guidelines for buying U_3O_8 from Canada.

The guidelines are not established by legislation. Canadian producers receive informal guidance on contract terms prior to submission of a proposal to sell. After a contract is signed, it is submitted to the Panel for formal review and approval. Since contracting guidelines are informal, they are also subject to change. There is no *guarantee* that because a certain provision received approval in a prior contract it will receive approval in a future contract. This coordination process between industry and government seems to be working well and allows the government to keep its options open.

From contracts already approved, it can be inferred that:

1. Uranium can be sold at firm or escalated prices for delivery over the next few years.

2. Long-term offers can be made for delivery into the early 1990's on a market price basis. A floor price is mandatory. Occasionally, deliveries can extend beyond the 1990's.

3. Exemptions to the policy of upgrading material to UF_6 prior to export will be granted if there is a reasonable basis for doing so. The reasons might include buyers with existing conversion contracts, or non-competitive offers from Eldorado.

In the past, it was apparently possible to receive authorization to export U_3O_8 (rather than UF_6) as many as eight to ten years into the future. Now such exemptions will be granted only three or four years into the future. This change in the informal guidelines has occurred over the last several months and may be related to Eldorado's plan for capacity expansion.

Eldorado's UF_6 conversion capacity has been full recently, but a major expansion is underway. With Eldorado at full capacity, exceptions to the upgrading policy did not pose a problem. Now that Eldorado will have additional capacity, the Canadian government is maintaining its options by limiting the length of time for which an exemption initially will be granted.

EUROPE

Nuclear power's share of electricity production in **France** rose to 37.7 percent from 23.5 percent in 1980, according to provisional figures for 1981 published by Electricite de France (EdF). EdF attributed a 3.8 percent increase in total French electricity consumption almost entirely to additional consumption by Eurodif's enrichment plant.

In **Great Britain**, the cabinet announced on January 20 that it has delayed the start of the public inquiry to examine plans to build Sizewell B, Britain's first PWR, from the fall of 1982 to January 1983. The timetable was revised to give witnesses at least six months to examine the documents prior to the inquiry. The start of

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construction, which had been expected in 1983, is now planned for the spring of 1984. Senior ministers in the government fear that the plant could become an election issue. The extra safety precautions, including four rather than two independent emergency core cooling systems, will increase the plant's cost by about 20 percent, but power from Sizewell B should be 30 percent cheaper than that from an AGR.

According to l'Union Belge des Exploitations Electriques, 21.6 percent of **Belgium's** electricity production in 1981 came from nuclear power. This percentage will rise to more than 40 percent after Doel Unit 3 and Tihange Unit 2, each 900 MWe, come into service in 1982. These units are two of the four reactors currently under construction in Belgium. The other two, 1,000 MWe each, are planned for operation in mid-1984.

The third 1,000 MWe block at the nuclear station Tschernobyl in the Ukraine, **USSR** will be on line for the first time "shortly" (as stated in a December 1981 report from the area). The unit is a PWR of the RBMK type. The first two units have been in operation since 1977 and 1978 respectively. Three more similar units are planned for the station.

Eventually the station may be increased to about 12,000 MWe, which would include four 1,500 MWe size units. A 750 KV transmission line is being built to carry the power from Tschernobyl to Winniza where it will connect to already existing lines to transfer the power to Albertirsa in central Hungary. From Hungary, the power will eventually go to Austria and other west European countries.

In December 1981, the USSR nuclear plant Rovno Unit 2 was connected to the distribution grid. This plant is a 440 MWe PWR. The Rovno site is reported to be near the sites containing the Leningrad and Tschernobyl units.

In late December 1981, the research reactor FR2 at the Karlsruhe, **West Germany** nuclear research center was shut down permanently after more than 20 years of operation. The start-up of West Germany's newest nuclear power plant, Grafenrheinfeld, is progressing well. Plant operating level is now at 30 percent. It is expected to reach full power output of 1,300 MWe within the next few weeks.

In **Sweden**, the Ringhals Unit 3 plant has been shut down since last fall as a result of vibration problems in the steam generator. The Swedish State Power Board has proposed to limit operations to 50 percent of the nominal output pending permanent corrective action, but so far the regulatory authorities have not approved the proposal. As a result of the loss of this generating capacity and the extreme winter conditions, Sweden has had to depend on operation of costly oil fired peaking units to meet power demands.

In **Italy**, the Caorso plant continues to operate well. In keeping with the government approved nuclear power program to build three more units, three regions have been designated as locations for the units. The three areas include one near Milano, one near Torina and one in the extreme southeast part of Italy. The government has requested local authorities to recommend specific sites within those regions by May 1982.

The Chancellor of **Austria**, Mr. Kreisky, stated at a recent political meeting that he and his Socialist Party will support efforts in the next two years to eventually put Tullnerfeld into operation. He added that, if reelected in 1983, he will bring the issue to a formal vote once again.

On the other hand, the Free Democratic Party has said they never will support operation of the plant. Thus, the key factor will be the position of the third party, the People's Party. The People's Party position is that they would not support startup of Tullnerfeld until the radioactive waste disposal problem is resolved to their satisfaction. The US may be asked by the Socialists and the People's Party to help solve the waste issue by agreeing to take Austrian waste for disposal in the US. In return, Austria would start up Tullnerfeld and so would not have to import gas from the USSR.

In **Switzerland**, enough signatures have been obtained on a petition to allow for a referendum preventing any new nuclear power plants from being built, including Kaiseraugst. It could take up to two years to organize the referendum, so it is likely Kaiseraugst will be postponed for that amount of time.

FAR EAST

Japan's Ministry of International Trade and Industry (MITI) is preparing to lower its official target for installed nuclear power generating capacity in 1990. The present official target of 51,000 to 53,000 MWe, established in January 1981, will be reduced by more than twenty percent, to 40,000 to 50,000 MWe. Given current siting and licensing constraints, even the lower end of the

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new range seems optimistic.

Notwithstanding these revisions, Japan continues to make steady progress in its nuclear program. In line with previous forecasts (Nuexco Report 158), Chubu Electric Co. has placed the order for its Hamaoka Unit 3, and anticipates the unit will begin service by 1986. Similarly, Shikoku's Ikata Unit 3 is now scheduled for 1988 operation.

A portion of the Japanese government program aimed at reducing its trade surplus with the US and Europe calls for the importing and stockpiling of various metals and minerals. The absence of uranium from the list of items to be stockpiled is a clear indication that the Japanese government views the nation's current uranium situation as comfortable.

Kansai Electric Power Co., Shikoku Electric Power Co. and Kyushu Electric Power Co., the Japanese shareholders (and customers) of Energy Resources of Australia (ERA, the Ranger Project) will not stockpile their U_3O_8 output from the project; instead, they will have it delivered to overseas conversion facilities. This decision was dictated mainly by existing conversion commitments, but concern over shipping strikes and other work stoppages also played a role.

SOUTH AMERICA

Despite continuing financial problems, **Argentina** is moving ahead with its commitment to nuclear power. Concrete to house the country's third nuclear power plant, the 692 MWe Atucha II, was poured in late 1981. The unit, located in the province of Buenos Aires, very near the site of Atucha I, is scheduled for operation in 1987.

The financial problems of Argentina's Comision Nacional de Energia Atomica (CNEA) stem in part from peso devaluations which affected the working capital of the organization. Also, Argentina's President Viola was replaced before he had provided the CNEA with funds pledged last June. The CNEA has been lobbying for a budget increase from the Argentina government to speed up payments to CNEA suppliers.

Like Argentina's two other nuclear units, Atucha II is a pressurized heavy water reactor (PHWR), which burns natural uranium and uses a heavy water moderator. The two units are the 342 MWe Atucha I plant, which has been operational since 1974, and the 600 MWe Embalse plant which is now scheduled to go into service in 1983. Although the Embalse and Atucha II plants are continuing on schedule, the CNEA financial situation clouds the future of the additional plants scheduled under Argentina's nuclear program. Argentina's choice of the PHWR technology has allowed it to pursue its nuclear development relatively unhampered by its inability to reach agreement with the US on certain nonproliferation matters.

The Atucha II project, unlike its two predecessors, will have considerable local involvement in all phases of its development. The Argentine Nuclear Electrical Power Stations Co. Ltd. (ENACE S.A.) was created expressly to manage the project. It is owned 75 percent by the CNEA and 25 percent by the German company Kraftwerk Union A.G., the supplier of Atucha II.

Atucha II will differ also in its use of domestically produced fuel and moderator. Despite problems with the new Sierra Pintada mine, Argentina is capable of producing sufficient uranium to support its nuclear program, even after having lent some 500,000 pounds U_3O_8 to Brazil. All of Argentina's uranium concentrate comes from four properties; three use the heap-leach recovery method and one is conventional. Total capacity is approximately 500 thousand pounds U_3O_8 per year.

In addition to the four operating properties, two projects are under development by private contractors. The La Estela project in San Louis Province is scheduled to begin production this year at a rate of approximately 50 thousand pounds U_3O_8 per year; the Los Gigantes project in Cordoba Province is to have an annual production capacity of approximately 200 thousand pounds U_3O_8. The start-up date of the latter project is uncertain at this time. The heap leach recovery method will be used at both projects.

Completion of the La Estela and Los Gigantes projects would increase Argentina's annual production capacity to approximately one million pounds U_3O_8. However, of the four centers now in production, all but one are being phased out due to lack of ore reserves. Originally all four production centers were scheduled to phase-out with the start-up of the Sierra Pintada project about mid-1983. Sierra Pintada will not be in production as scheduled; therefore, the projects under development most likely will serve to maintain production capacity at approximately the current level.

CNEA reports reasonably assured uranium reserves for the country of 30,000 metric tons U_3O_8. To enable annual production to continue to exceed annual requirements, CNEA has proposed the immediate development of two deposits in the Sierra Pintada district. Annual

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production capacity from the two deposits could reach one million pounds U_3O_8 within four to five years after start of construction, but the start of production from the two deposits could be delayed until 1986. If so, the CNEA plan to export surplus U_3O_8 during the mid to late 1980's would be jeopardized; all production would probably be reserved for domestic use.

According to **Brazil's** nuclear power agency Nuclebras, recovery of uranium concentrate by the country's first yellowcake plant began in December, 1981. Regular operation is scheduled for the first quarter of 1982 with the completion of three months of tests.

UNITED STATES

The contraction of the US uranium production sector continued during January. The following is a list of recent announcements of cutbacks and shutdowns.

1. Atlas Minerals will lay off about 34 percent of the workforce at Moab.
2. Exxon Nuclear Corp. will be closing altogether its Highland underground mine in Wyoming, but will continue to run the mill at a reduced level.
3. Exxon's Felder mine in south Texas is scheduled to close in mid-1982.
4. Mining at the Midnite Mine (51 percent Newmont Mining Corp. and 49 percent Dawn Mining Co.) on the Spokane Indian Reservation has ceased and may not resume in 1982 unless market conditions improve.
5. Mining and milling at Western Nuclear Inc.'s Sherwood site, also located on the Spokane reservation, will continue, but at a reduced level.

Rochester Gas & Electric's Ginna unit was shut down on January 25 following a loss of primary coolant. The incident began when a leak at the plant's steam generator tubes allowed a small amount of primary coolant to escape to the secondary system and thence, to the atmosphere. In accordance with procedure, operators briefly opened the pressurizer relief valve to reduce primary system pressure and thus, the leakage rate. When they repeated the procedure, the relief valve failed to open. Officials of Rochester Gas & Electric at first estimated that 5,000 to 10,000 gallons of radioactive water escaped into the containment building before operators could shut the back-up valve. A subsequent inspection of the containment building indicated that the original estimates had been too high.

The rapid loss of pressure at normal operating temperature caused a steam bubble to form at the top of the reactor vessel. Operators acted promptly to stop the loss of coolant, raise pressure and collapse the steam bubble. The plant could be running at full power again within a few weeks.

The New Hampshire Public Utilities Commission directed that Public Service of New Hampshire reduce its interest in the Seabrook plant to 25 percent from the current 35 percent within six months. Without the reduction, the Commission will consider regulatory measures to delay or cancel Seabrook Unit 2. The Commission deemed the action necessary to maintain the financial health of the utility. Both major bond rating services, Moody's and Standard & Poor's, immediately downgraded the utility's bonds. Consequently, the Commission's actions worsened, at least for the short term, the financial health they ostensibly were trying to preserve. The Commission reacted by "forbidding" further financing of Seabrook 2.

Washington Public Power Supply System (WPPSS) announced a plan for "controlled termination" of WNP Units 4 and 5 after the financial scheme to mothball the two units for two years and defer construction costs was scrapped by the 88 participants in the project. This termination could add more than $800 million to the cost of the twin units 1 and 3. The background of this event is discussed in the *Market Analysis* section of this Report.

A TVA staff report indicates that demand for electricity in TVA's service area will not grow enough to justify completion of the three nuclear plants the utility still has under construction. Thus, it is likely that the TVA Board of Directors will defer indefinitely the two Hartsville projects and one at Yellow Creek when it meets February 3, 1982.

On the brighter side, Southern California Edison's San Onofre Unit 2 was licensed for fuel loading and low power testing by the NRC last month. Additional approvals for full power generation are expected within a few weeks.

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MARKET DATA

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Periods* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 5 Years	Remarks
Available for Sale:				
1475	1,000			UF$_6$
1490	1,000			
1575			500	Long Term
1581	150	150	150	Long Term
1584	1,000			
1600	250	250	250	Long Term
1610	200			
1637	1,000			
1684	500			UF$_6$
1738	750			UF$_6$
1749	350	200	200	
1769A	110			UF$_6$
1770	350			
1774	50			
1804	615			
1805	500	500	500	Long Term
1807	700			
1810		750		
1814	250			
1818		250	250	Long Term
1824	20			
1812A	1,000			
1867	10			
1872	250			
1877	50			
TOTAL:	10,105	2,100	1,850	
Available for Loan:				
1695	225	325	325	UF$_6$
1742	200			
1785	1,000			
1815	1,000			UF$_6$
1884	275			
TOTAL:	2,700	325	325	

***Measured from the date of this Report.**

MARKET DATA

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8)			Remarks
	0 to 1 Year	1 to 2 Years	2 to 5 Years	
Inquiries to Purchase:				
1410		1,500	1,500	
1459			200	Long Term
1603			100	Long Term
1634		400		
1699	650	550	250	
1724	650	500	500	Long Term
1732	50			
1744	1,000			
1775	20			
1868	300	200	200	Long Term
1874	1,000			
1875	350	350		
TOTAL:	4,020	3,500	2,750	
Inquiries to Borrow:				
1621	300			
1780	500			
1812	1,000			
TOTAL:	1,800			

***Measured from the date of this Report.**

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MARKET DATA

Market Opportunities are *active* inquiries in the secondary market for UF₆ conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF₆) 0 to 1 Year	1 to 2 Years	2 to 5 Years	Remarks
1451	75			
1584		300	300	Long Term
1607	850			
1609	500	1,500	1,000	Long Term
1619		250	50	
1661	200			
1684	450			
1764	100			
1840	200			
TOTAL:	2,375	2,050	1,350	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF₆) 0 to 1 Year	1 to 2 Years	2 to 5 Years	Remarks
1594		400	950	Long Term
1622	500	900		
TOTAL:	500	1,300	950	

***Measured from the date of this Report.**

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MARKET DATA

CURRENT TRANSACTIONS*

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1681	82	101-300	104	US	US	
1695	82	101-300	—	US	US	Definitive price info not available
1696	82	101-300	101	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks
1708	82	301-600	100	US	US	

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*Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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URANIUM PRODUCTION IN 1981

Nuexco's estimate of 1981 uranium production for the major producing regions is presented in Table 3; 1980 production figures are shown for comparison.

Table 3

WORLD URANIUM PRODUCTION
(millions of pounds U_3O_8)

	1980 (Actual)	1981 (Estimated)	Percent Change
US	42.5	36.7	-14
Australia	3.9	8.1	+108
Canada	18.7	20.1	+7
Republic of South Africa	15.7	15.9	+1
Other Africa	23.4	23.5	negligible
France	5.6	5.8	+4
Other	1.0	1.5	+50
TOTAL	110.8	111.6	+1

Total uranium production in 1981 was essentially the same as in 1980, but its distribution among the major producing regions changed somewhat. During 1981, lower cost production from Australia and Canada began to displace higher cost US production; increased output from Australia and Canada almost exactly offset the 14 percent decline in US uranium output.

Within the US, the distribution of uranium production among the states shifted noticeably, as shown in Table 4. Essentially all of the reduction was due to closings and production cutbacks in conventional operations in Wyoming and New Mexico. In-situ leach and by-product operations fared somewhat better in the weakened market environment that prevailed throughout 1981.

Nuexco had anticipated a decline in US production in 1980 in response to the contraction of the US nuclear program and declining uranium prices. That decline developed surprisingly slowly (1980 production actually increased 13 percent to 42.5 million pounds) and did not become evident until 1981.

Table 5 shows Nuexco's forecast that 1982 production will decline further to 28.2 million pounds in 1982. That amount will represent a 23 percent reduction from 1981. As in 1981, New Mexico and Wyoming and conventional mining operations will show the greatest declines, but some in-situ leach operations will be curtailed as well.

Table 4

US URANIUM PRODUCTION
(millions of pounds U_3O_8)

Mill Location	1980 (Actual)	1981 (Estimated)	Percent Change
New Mexico	14.9	12.2	-18
Wyoming	12.1	8.4	-31
Texas	6.4	5.3	-17
Utah	3.6	4.9	+36
Others	5.5	5.9	+7
TOTAL	42.5	36.7	-14

Table 5

US URANIUM PRODUCTION
(millions of pounds U_3O_8)

Mill Location	1981 (Estimated)	1982 (Forecast)	Percent Change
New Mexico	12.2	8.1	-34
Wyoming	8.4	6.3	-25
Texas	5.3	4.8	-9
Utah	4.9	3.3	-33
Others	5.9	5.7	-3
TOTAL	36.7	28.2	-23

Table 6 shows Nuexco's forecast that world uranium production will decline in 1982 as a consequence of reduced demand for uranium in worldwide markets. As in 1981, Australia will be the major gainer, while the US will be the major loser. Countries in the "Others" category will show the most dramatic percentage changes, but their overall impact will remain negligible.

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Table 6

WORLD URANIUM PRODUCTION
(millions of pounds U_3O_8)

	1981 (Estimated)	1982 (Forecast)	Percent Change
US	36.7	28.2	-23
Australia	8.1	12.1	+49
Canada	20.1	20.0	negligible
Republic of South Africa	15.9	16.6	+4
Other Africa	23.5	23.8	+1
France	5.8	6.7	+16
Other	1.5	2.3	+53
TOTAL	111.6	107.1	-4

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

Washington Public Power Supply System (WPPSS), known as "whoops" by supporters and critics alike, began the construction of five nuclear power plants in the early 1970's with a projected budget of $4 billion. Since that time, there have been many controversies involving the project, predominantly over cost overruns and management competency. The most recent controversy centered on WNP Units 4 and 5 and culminated with their cancellation.

WPPSS, the largest issuer of tax exempt bonds in the US with nearly $7 billion outstanding, has been raising funds at the rate of approximately $160 million every two months. The bonds are guaranteed for repayment whether the units are completed or not. The Bonneville Power Administration, a federal energy distribution agency in the northwest US, having agreed to buy the power from WNP Units 1, 2 and 3, is essentially guaranteeing the bonds for those three units. The bonds for WNP Units 4 and 5 are to be paid off by a group of 88 utilities. Because of this difference in backing, bonds for WNP Units 4 and 5 were more difficult to sell and WPPSS was running out of cash for their construction. Adding to their financing problems, studies indicated little need for the electricity the two units were to supply. Consequently, construction on WNP Units 4 and 5 was effectively halted in mid-1981 for a thorough review of the issue.

The mothball plan called for various utilities and customers to supply the funds to pay the interest charges on the $2.25 billion in bonds already issued for WNP Units 4 and 5. Even though the majority of the costs were to come from the larger utilities and users, many of the smaller municipal utilities were still reluctant to agree to the plan. Lacking their support, the plan failed and WPPSS had no choice but to terminate WNP Units 4 and 5.

The controversies surrounding WPPSS will not end with the termination of the two units. In November 1981, Washington state residents passed an initiative requiring voter approval of WPPSS's construction budget and bond issues after July 1, 1982. Bond fund trustees for WNP Units 1 through 3 have filed suit in federal court, charging the initiative is unconstitutional in that it impairs bondholders' contract rights.

With WNP Units 4 and 5 cancelled, WPPSS will have to begin accumulating funds to retire the bonds; that will mean an increase in the electricity rates charged by the 88 participating utilities. It is expected that there will be a challenge to the provision that calls for the bonds used to finance construction to be repaid whether the units are completed or not. This will likely mean the $4 billion in bonds needed by 1986 for WNP Units 1-3 will be much more expensive, as investors perceive increased risks with the project.

QUANTITATIVE FACTORS AFFECTING URANIUM PRICES

The January 31, 1982 Exchange Value of $23.00 per pound U_3O_8 marks a new low, after six months at $23.50 per pound U_3O_8. Some people had interpreted the six months of stability as a signal that the long-awaited bottom of the price decline had arrived; many people hoped that a rapid price recovery was imminent.

During the past year, Nuexco published a series of analyses which discussed some of the quantitative factors which affect uranium prices and which will have a substantial impact on their future behavior. This article will briefly review a few of those analyses.

Before proceeding, it is important to note that neither this article nor any of those it reviews attempts to forecast prices. To do so would be to ignore numerous *qualitative* factors, both internal and external to the uranium market, which are just as important as the quantitative factors.

Supply, demand and inventory are three major factors affecting the current market situation. A persistent imbalance between supply and demand has led to a

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buildup of inventory that is one of the most important reasons for the weakness of the uranium market. Nuexco Report 159 evaluated the supply and demand balance for the world. Table 7 is excerpted from that article. The production forecast, based on Nuexco data, was prepared on a mill by mill basis. The consumption figures are calculations by Nuexco that take into consideration various quantitative parameters of each individual reactor. Report 159 details the specific methodology used in Nuexco's calculation of Apparent Future Consumption (AFC).

The critical conclusions to be drawn from this table stem from the "Relative Inventory" line. At every point during this decade, (according to this analysis) world utilities will collectively hold an average of five to six years' worth of inventory. Studies have indicated that utilities would ideally like to hold between zero and a few years of inventory, but in no case do they wish to be holding five years' worth. Thus, Table 7 indicates that a large overhang of excess supply can be anticipated for at least the next eight years, even after ignoring any impact of government stockpiles.

Table 8 performs the same supply and demand comparison as Table 7, but for the US only. The US picture is somewhat different than the rest of the world, in that the rapidly declining US production will give some US utilities the option to reduce their high inventory levels through consumption. Nonetheless, inventory levels are sufficiently high so that it is only in the last few years of this decade that the forecast relative inventory diminishes to levels considered acceptable by utilities. In examining these two tables, it is difficult to perceive any potential scarcity of supply. This attitude is widely held by utilities; consequently, they feel little pressure to execute contracts for future supply. In addition, the perception by utilities that there is a significant quantity of uranium available, and that there will be for quite some time to come, has altered their concept of the ideal inventory level. Where a given utility might have felt in 1975 that a three-year forward inventory was required, current uranium availability may have caused the desired magnitude of this safety margin to be revised downward to one or two years.

An independent corroboration of this pessimistic

Table 7

URANIUM SUPPLY-DEMAND BALANCE: WOCA[1]
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION[2]	111.0	109.8	106.6	107.8	107.8	103.7	104.7	108.3	108.2	107.1
less										
CONSUMPTION[3]	52.7	58.8	76.2	80.2	82.9	92.3	90.5	104.3	91.2	97.9
equals										
NET INVENTORY INCREASE	58.3	51.0	30.4	27.6	24.9	11.4	14.2	4.0	17.0	9.2
plus										
BEGINNING INVENTORY	367.8[4]	426.1	477.1	507.5	535.1	560.0	571.4	585.6	589.6	606.6
equals										
ENDING INVENTORY	426.1	477.1	507.5	535.1	560.0	571.4	585.6	589.6	606.6	615.8
RELATIVE INVENTORY (years)[5]	5.2	5.4	5.5	5.6	5.8	5.9	5.9	6.0	6.1	6.2

[1] World outside Communist areas

[2] Nuexco Report 158, Table 3

[3] Nuexco Report 159, Table 3

[4] Nuexco estimate

[5] For each year, Relative Inventory equals the number of years' forward consumption which could be supplied by that year's Beginning Inventory.

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Table 8
URANIUM SUPPLY-DEMAND BALANCE: US
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION[1]	37.2	27.9	23.4	20.3	18.5	15.5	15.3	14.9	14.9	13.6
less										
CONSUMPTION[2]	20.6	21.4	28.2	29.6	31.4	36.1	34.2	37.6	33.9	40.4
plus										
NET IMPORTS (EXPORTS)[3]	(2.1)	0.7	0.8	2.6	0.4	1.9	1.0	1.4	1.5	1.5
equals										
SUPPLY SURPLUS (DEFICIT)	14.5	7.2	(4.0)	(6.7)	(12.5)	(18.7)	(17.9)	(21.3)	(17.5)	(25.3)
plus										
BEGINNING INVENTORY	147.8[4]	162.3	169.5	165.5	158.8	146.3	127.6	109.7	88.4	70.9
equals										
ENDING INVENTORY	162.3	169.5	165.5	158.8	146.3	127.6	109.7	88.4	70.9	45.6
RELATIVE INVENTORY[5] (yrs.)	5.5	5.5	5.3	4.9	4.6	4.1	3.5	2.9	2.3	1.8

[1] Nuexco Report 158, Table 1
[2] Nuexco Report 157, Table 6
[3] Nuexco Report 159, Table 8
[4] "US Uranium Market Developments"; S. Victoria Krusiewski and David C. Thomas; US DOE; Grand Junction, Colorado; October 1981.
[5] For each year, Relative Inventory equals the number of years' forward consumption which could be supplied by that year's Beginning Inventory.

outlook on the US inventory picture comes from the US Department of Energy. This table is reproduced as Table 9A. The USDOE conducted a survey of the US uranium industry in which it assessed the actual inventory level. Nuexco's survey of desired inventory levels is summarized in Table 9B. Note that even if the 64 million pound government excess did not exist, the available inventory would still be greater than the desired level by a factor of three. One reaction utilities have had to the excessive inventory situation has been to put some of their inventory on the market. In a reversal of the usual situation, non-producer sellers represented over 40 percent of the spot and near-term market volume in 1981 and non-producers bought only 73 percent of the material.

In drawing conclusions based on quantitative analysis, it is imperative to be aware of the basis on which the analysis was done. In some ways, the use of AFC as the demand component of Tables 7 and 8 is a realistic model of what will happen, but not necessarily of utilities' current perceptions of what will happen. A three-part essay in Reports 151, 153 and 154 examined these utility

Table 9
ASSESSMENT OF US URANIUM INVENTORY POSITION
(millions of pounds U_3O_8 equivalent)

A. AS OF JANUARY 1, 1981[1]

Producers	5.4
Electric Utilities	142.4
US DOE	163.8
Total	311.6

B. DESIRED POSITION[2]

Producers	5
Electric Utilities	35
US DOE	100
Total	140

[1] Nuexco Report 160, Table 1
[2] Nuexco Report 160, Table 2

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Table 10

A. WORLD UTILITY DEMAND[1]
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Far East	8.0	12.4	13.7	16.2	18.2	21.0	20.9	22.3	22.1	22.5
Europe	32.3	39.5	39.6	44.9	42.8	46.8	51.2	48.0	49.1	49.0
Other WOCA	4.0	5.3	6.5	6.3	7.0	7.4	8.7	8.6	7.9	9.1
US	36.6	37.3	42.4	48.3	52.9	55.9	55.9	56.9	57.5	57.3
World Total:	80.9	94.5	102.2	115.7	120.9	131.1	136.7	135.8	136.6	137.9
Cumulative:	81	175	278	393	514	645	782	918	1,054	1,192

B. WORLD UTILITY DEMAND LESS AFC[2]
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Far East	1.1	5.5	6.9	5.1	6.5	9.4	10.2	12.7	13.6	13.8
Europe	6.7	10.6	4.2	14.1	6.5	8.8	6.3	5.6	5.8	6.3
Other WOCA	0.9	0.2	0.6	1.2	2.4	1.5	1.2	1.6	2.3	3.0
US	15.7	14.4	15.3	17.9	20.1	20.4	20.8	19.3	17.1	17.0
World Total:	24.4	30.7	27.0	38.3	35.5	40.1	38.5	39.3	38.8	40.0
Cumulative:	24	55	82	120	156	196	235	274	313	353

[1] Nuexco Report 154, Table 6
[2] Nuexco Report 154, Table 7

Table 11

IMPACT OF CANCELLED REACTORS 6/79-6/81[1]

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991-1995
Cancelled GWe	0	0	1.1	.6	1.2	2.4	.9	5.7	.9	4.5	8.3
Cumulative Cancelled GWe	0	0	1.1	1.7	2.9	5.3	6.2	11.9	12.8	17.3	25.6
Lost Demand (millions of pounds U_3O_8)	1.1	0.6	1.5	2.9	2.3	6.8	4.1	8.7	4.5	8.1	41.6
Cumulative Lost Demand (millions of pounds U_3O_8)	1.1	1.7	3.2	6.1	8.4	15.2	19.3	28.0	32.5	40.6	82.2

[1] Nuexco Report 160, Table 5

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perceptions; Tables 10A and 10B summarize the results. While Apparent Future Consumption was derived empirically, the demand figures published in these Reports were determined by canvassing the utilities on an individual basis. Generally, it was found that utilities had a perception of greater need than Nuexco's AFC calculations would indicate. However, as one projects fewer and fewer years into the future, the utilities' perception comes closer and closer to the calculated AFC estimate. Thus, AFC can be considered to be the most likely demand case, while demand based on utility perceptions of need is the idealistically high demand case.

Table 12

IMPACT OF FORECAST CANCELLATIONS[1]

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991-1995
Cancelled GWe	0	0	0	1.2	1.3	1.2	2.4	1.2	2.5	2.3	4.9
Cumulative Cancelled GWe	0	0	0	1.2	2.5	3.7	6.1	7.3	9.8	12.1	17.0
Lost Demand (millions of pounds U_3O_8)	0	1.2	1.3	2.0	3.6	3.1	4.5	5.5	5.9	5.2	27.9
Cumulative Lost Demand	0	1.2	2.5	4.5	8.1	11.2	15.7	21.2	27.1	32.3	60.2

[1] Nuexco Report 160, Table 6

Table 13

A. WORLD UTILITY UNFILLED DEMAND[1]
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Far East	0.0	0.1	0.1	0.1	0.3	1.8	1.3	4.3	3.4	6.4
Europe	1.5	1.7	3.3	3.7	3.9	5.5	5.7	6.9	8.4	7.4
Other WOCA	0.4	0.7	1.8	1.6	2.3	1.6	1.9	2.6	1.9	2.2
US	0.3	1.5	4.4	6.4	12.3	14.9	23.8	28.9	33.6	36.3
World										
Total:	2.2	4.0	9.6	11.8	18.8	23.8	32.7	42.7	47.3	52.3
Cumulative:	2	6	16	28	46	70	103	146	193	245

B. WORLD UNSOLD PRODUCTION[2]
(millions of pounds U_3O_8)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Annual:	16.8	16.8	17.5	22.4	25.1	32.9	35.8	37.3	40.2	39.6
Cumulative:	17	34	51	74	99	132	167	205	245	284

[1] Nuexco Report 154, Table 8
[2] Nuexco Report 154, Table 9

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Tables 10A and 10B quantify the difference between demand and AFC. The difference between the two sets of numbers reflects the safety margin which the utilities build into their estimates of needs to insure security of supply. Unfortunately for the uranium market, it is far more likely that consumption will approximate the AFC figures rather than the demand figures. Therefore, the AFC numbers are more likely to yield an accurate representation of the effect of consumption on the balance between supply and demand.

Report 160 included an analysis of reactors that have been cancelled over the past two years and the impact that the cancellation of these units had upon demand. That impact is indicated in Table 11. Until the reactors were officially cancelled, the utilities had to plan for their fuel supply, so their perceived demand was higher than their actual needs proved to be. The AFC calculation had already made an allowance for these cancelled units. Nuexco estimates that more than a dozen additional reactors will be cancelled over the next few years. Those cancellations will also reduce utilities' perceptions of demand. The impact of those forecast cancellations is quantified in Table 12. The reactors Nuexco expects to be cancelled have been removed from the AFC database, but there still is a demand component until the utilities formally cancel them.

Tables 13A and 13B show the utilities' estimates of unfilled demand and Nuexco estimates of the world unsold production available to fill it. Not until 1990 does the cumulative total of unfilled demand overtake the cumulative total of world unsold production. Even under this form of analysis, the quantitative factors point toward a decade of excess supply and downward pressure on uranium prices.

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ESSAY

URANIUM PRICES AND LONG-TERM CONTRACTS

In Nuexco Report 159, the *Essay* discussed the definition of Exchange Value in some detail. Specifically, it attempted to clarify what the Exchange Value is and what it is not. The *Essay* concluded that there is consensus within the uranium industry that the Exchange Value is one indicator of the level of spot market prices. Unfortunately, from the viewpoint of many buyers and sellers, there is no corresponding indicator of the level of long-term market prices.

Long-term Uranium Prices

It is quite understandable that there is no generally accepted indicator of the long-term market price of uranium. There is not even consensus regarding the meaning of the term "long-term market price." Repeated attempts to define the term have failed. Without consensus on the definition, it has been impossible to obtain general agreement on what would be measured, how it would be measured, what time frame would be considered or how frequently it would be measured.

Lacking a generally recognized indicator of long-term market price, buyers and sellers have repeatedly attempted to develop pricing mechanisms that will generate, throughout the delivery period, prices that will prove acceptable to both parties upon delivery of the material. The high incidence of uranium contract disputes in recent years indicates that, notwithstanding some notable exceptions, such pricing mechanisms have generally failed to achieve their objectives. As more buyers and sellers try to enforce or repudiate contracts, more litigation is likely.

Among a wide variety of increasingly complex pricing mechanisms, the most commonly used types are those based on some function of:

1. spot market price level;
2. production cost;
3. base price.

Each of these pricing mechanisms has limitations which can lead to large variations in prices applicable to current deliveries under long-term contracts.

The Exchange Value is primarily an indicator of the level of spot market prices. To a lesser degree, it provides valuable information about the price situation in the near-term market (in which deliveries are completed within 12 months of contract execution). The use of Exchange Value (or any other indicator of spot market price levels) to price future deliveries under a long-term contract exposes such future prices to whatever volatility may occur in the spot and near-term markets.

The uranium industry is characterized by price-conscious buyers and wide variations in producers' costs. A price that provides a 25 percent rate of return for a US open pit operation having a head feed grade of 0.20 percent U_3O_8 might be enormously profitable for Australia's Nabarlek deposit which has a head feed grade of nearly 2.0 percent U_3O_8; that same price could mean economic disaster for a deep underground operation having a head feed grade of 0.10 percent U_3O_8. As long as this situation prevails, the determination of long-term market price as a function of production cost or return on investment will be feasible only on a case-by-case basis. Variations in producers' cost structures will prevent the adoption of either a reference production cost function or a standard return on investment.

Long-term pricing using an escalated base price formula is also susceptible to wide variations, particularly as a function of when in the market cycle the particular contract is executed. Even contracts executed at approximately the same time with similar base prices may produce substantially different prices in latter years due to differing escalation provisions.

Finally, there is a fundamental difference between the spot market and the intermediate or long-term markets which makes it much more difficult to develop a consensus regarding price levels in the latter. In the spot market, there is virtually total certainty. The material to be sold has already been produced. Contracting terms tend to focus only on delivery date, price and payment. As a consequence, there is price certainty within a narrow band. On the other hand, inherent in a long-term contract are numerous uncertainties, including future production costs, political developments, government regulations, future market behavior, delivery flexibility and the financial intergrity of the parties. These factors can all affect price either directly or indirectly. Consequently, the price band for such contracts will almost certainly be quite wide.

Even though many buyers and sellers would like to see a generally recognized, objectively determined indicator of long-term market price, the development of such a price seems unlikely. Therefore, the determination of prices in long-term agreements will continue to be a controversial subject for buyers and sellers. Each agreement will require an independent price negotiation in which the parties will have to determine which price mechanism best suits their individual situations. Further,

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it seems likely that events and price trends in nearer-term markets will continue to influence price negotiations for long-term contracts, even though some buyers and sellers deplore that influence.

Long-term Contracts

The comparison of current delivery prices under long-term contracts to current spot market prices has caused problems with respect to both existing long-term uranium supply contracts and negotiations of new contracts. The problems with existing contracts are of two distinct types, but both originate with contracts and pricing terms which were entered into (or renegotiated) during the 1975-1978 period when prices peaked. In the first case, delivery prices are directly related to Exchange Value or some other published indicator. The decline in Exchange Value has led to some producers receiving prices which are less than their costs of production. Such a situation would be intolerable to producers in the long term. Consequently, both buyers and sellers are searching for pricing approaches which will mitigate such difficulties in new contracts for intermediate or long-term delivery. However, in today's market, many buyers are unwilling or unable to enter into contracts in which the price mechanism might cause them to pay more than spot market price at time of delivery. This effectively rules out cost formulas, escalated base prices and those "market price" contracts that contain floor or minimum prices, unless the buyer has the right to refuse delivery when the contract price exceeds the spot market price.

For their part, most sellers are unwilling or unable to guarantee delivery at spot market prices without some type of minimum pricing. Two reasons are apparent. First, and particularly in the US where average production costs are higher, guaranteed delivery at spot market price may lead to a long-term delivery obligation at prices which are below costs of production. Few sellers are willing to take such economic risks. Second, government policies in some countries prohibit such contracting without some type of minimum pricing.

In the second case, delivery prices are determined in accordance with an escalated base price or cost formula. This includes those contracts that provide for the buyer to pay the higher of a formula price or a market-related price. In many such instances, current delivery prices are well above current Exchange Value; in some instances, they even exceed $60.00 per pound U_3O_8. From the buyer's standpoint, the disparity between such delivery prices and current spot price is costly and embarrassing. These contracts and the prices being paid are subject to continuous scrutiny and criticism by utility management, by the news media, by local and federal regulatory authorities and, in the event of litigation or arbitration, by courts or arbitrators.

That the conflict between the positions of buyers and sellers should be so highly politicized is, for the most part, due to the nature of the uranium users (the electric utilities) and the nature of uranium itself. For example:

—The utility operates in a goldfish bowl environment. Every move is likely to be second-guessed by regulatory agencies, which are well aware not only of the price the utility pays for its uranium, but also of the generally perceived spot price of uranium at any point in time.

—Unlike oil and coal, the traditional utility fuels, uranium is produced as a standard concentrate. One producer's uranium is as good as another's. Thus, delivered prices for uranium are directly comparable.

—The transportation cost of uranium, unlike that of oil and coal, is a very small fraction of the delivered price, again making utility purchases comparable.

—Regulatory agencies seldom distinguish uranium purchased on the spot or near-term market, from uranium purchased under long-term contracts.

Thus, for the first time, utilities are using a fuel which is fungible on an international level. Therefore, the utilities are often under pressure to pay no more than the generally perceived spot price at the time of delivery. The result is an impasse.

This impasse has been complicated for buyers, sellers and regulators by the failure to distinguish the spot market from the longer-term market. These markets are actually quite different and so, consequently, are the prices associated with them:

1. Most uranium is delivered under intermediate or long-term agreements. These agreements constitute base load production for the supplier and base load supply for the utility. Therefore, in order for such arrangements to function effectively, prices must cover, over the long term, full cost of production and provide an adequate return on investment for the producer.

2. Most uranium sold for spot or near-term delivery comes from a producer's incremental output or a utility's excess inventory. Consequently, prices for such deliveries need not be, and often are not, related in any way to the production cost of the material sold. Prices vary widely based on the perceived balance of supply and demand.

To concentrate on current spot market prices to evaluate

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longer-term contracts is to confuse these two fundamentally different markets. It also ignores the benefits, other than price, which flow from a long-term relationship.

The decision to use Exchange Value to define delivery prices under a long-term contract is a matter for negotiation between buyer and seller when they enter into a contract. If buyers and sellers choose to use Exchange Value in this way, it is vital that both parties to the contract have complete mutual understanding of what the Exchange Value is and what it is not; then, both parties will be able to weigh the potential consequences of such use before they execute the contract.

The propensity of outside parties to use the current Exchange Value to evaluate contracts executed years earlier under different market conditions has created problems for buyers and sellers alike. To concentrate on today's level of spot prices sometimes impedes attempts to execute new long-term contracts. However, as long as regulatory authorities, utility managements and influential special-interest groups insist on comparing the prices of uranium delivered under long-term contracts to spot prices at time of delivery, utility buyers can be expected to exert pressure on sellers to offer long-term prices related to the spot market.

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SHOOTARING CANYON PROJECT

Introduction

Plateau Resources Ltd. has scheduled initial yellowcake production at its Shootaring Canyon project for the second quarter of 1982. The start of commercial operations would climax a uranium procurement program initiated almost seven years ago by Consumers Power Co.

Plateau was established in June 1976 as a wholly-owned subsidiary of Consumers Power Co. Plateau assumed the responsibility of expanding an existing uranium program with a primary objective of discovering uranium deposits to eventually supply uranium fuel for Consumers' nuclear generating program. Production capacity of the new plant is designed to satisfy all of Consumers' uranium requirements.

Project Description

Plateau initiated an aggressive exploration program almost immediately following its formation in 1976. An active program in the Henry Mountain district of southeast Utah was accelerated and additional prospect acreage was acquired in the Shootaring Canyon area. The program was eventually expanded to include about 250,000 acres of potential uranium-bearing ground throughout Wyoming, Colorado, Utah, Nevada, New Mexico and Arizona. At least 50 different prospects were under evaluation by Plateau at the peak of program activity in 1978 and 1979.

In conjunction with the exploration program, Plateau opened an ore-buying station in 1977 at Blanding, Utah to purchase ore mined by local independent miners to supplement future production from other Plateau projects. However, the buying station was closed in January 1979.

In 1981, essentially all exploration activity outside the Shootaring Canyon project area was terminated and the various prospects were divested. Full development of the Shootaring Canyon project was assigned first priority. Mine development had started by September 1977; the mill was sited in May 1978. The final environmental study was issued in July 1979 and construction began within 45 days. Figure I is a location map of the Shootaring Canyon area of interest.

Mine Development

Evaluation of the Shootaring Canyon project area required several years of detailed exploration. Nearly 2,000 drill holes, totaling about one million feet, were required to determine the potential of the 22,500 acre property. Drilling is continuing around the peripheral edges of the known orebodies and additional ore reserves are being discovered, especially along the down-dip extension of the main mineralized trend.

The Shootaring Canyon uranium deposits are being developed as two separate mines. The main mine, known as the Tony M, uses a double entry decline method of development. Two parallel adits measuring nine feet by 11 feet are being driven from the canyon wall on a three percent grade at a bearing of North 22 degrees West. The two adits are 50 feet apart and have been designated the West drift and the East drift. The drifts have advanced almost simultaneously and, as of the end of 1981, advance was in excess of 6,700 feet for the West drift and 7,000 feet for the East drift. Total planned length of each drift is in excess of 12,000 feet. However, considering the ore extensions discovered by recent drilling, it is likely that each drift will continue well beyond the planned length.

The two drifts will serve as the main access to all ore mined from the Tony M mine. The East drift will be reserved for all traffic and materials entering and leaving the mine; the West drift will be reserved for a 36 inch conveyor haulage system to transport ore and waste from the mine. The two drifts have been located to facilitate ready access to all orebodies. However, direct access to individual orebodies will be by lateral development drifts off either main drift. The lateral drifts will be positioned at irregular intervals as required to properly intersect a particular orebody; however, the minimum spacing will be on 136 foot centers. Actual mining of the ore will be a modified room and pillar technique designed to gain maximum production from the irregular configuration of each orebody.

The orebodies will be developed by driving parallel cross-cut drifts off the laterals on a regular spacing of 136 feet. A second set of cross-cut drifts will be driven on the same spacing but at right angles to the first set to establish rows of pillars within each ore zone. Mining of the pillars will begin at the outside limits of the developed ore zone, eventually retreating back toward the lateral drifts in the final stages of mining. Lateral development is already progressing rapidly into a number of ore-bearing areas. In fact, 13 miles of development work was completed by the end of 1981. Ore production from development activities is currently being maintained at about 500 tons per day. Production will eventually be increased to 1,700 tons ore per day, four days per week. In addition, about 650 tons of waste will be mined per day as mine development progresses.

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RAW MATERIALS

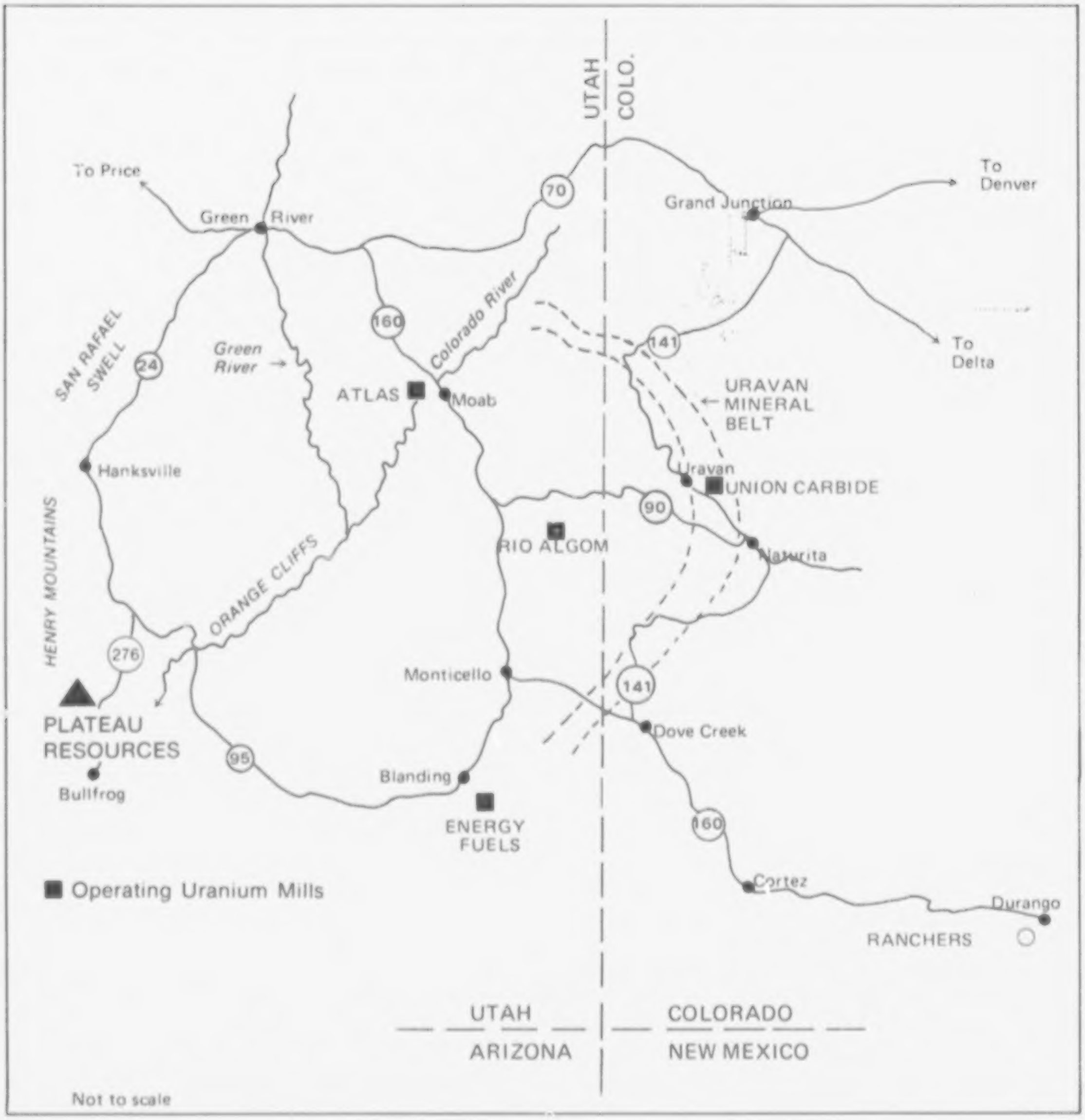
UTAH
COLO.
To Price
Green River
70
Grand Junction
To Denver
160
Colorado River
141
To Delta
SAN RAFAEL SWELL
24
Green River
ATLAS
Moab
URAVAN MINERAL BELT
Hanksville
Uravan
UNION CARBIDE
HENRY MOUNTAINS
90
RIO ALGOM
Naturita
ORANGE CLIFFS
276
Monticello
141
PLATEAU RESOURCES
Dove Creek
95
Blanding
Bullfrog
ENERGY FUELS
160
■ Operating Uranium Mills
Cortez
Durango
RANCHERS
UTAH
COLORADO
ARIZONA
NEW MEXICO
Not to scale

Figure 1

LOCATION MAP — URANIUM MINE & MILL PROJECT OF PLATEAU RESOURCES LTD., SHOOTARING CANYON AREA, UTAH

© NUEXCO 1982

Figure 2 is a photograph of the Tony M minesite.

The second mine, the Frank M, will be located on an irregular-occurring mineralized trend that strikes approximately North 60 degrees West and lies three miles north of the Tony M. The Frank M will be developed through a single entry decline off the mesa top rather than in from the canyon rim as is the case at Tony M. The decline will be driven 2,356 feet at a minus 20 percent grade to intersect the ore zone. Once the ore-bearing horizon is encountered, it will be developed by a double haulage drift system similar to the access system being utilized at the Tony M. The drifts will be inclined at a grade of five percent and progress on a heading of North 40 degrees West about 400 feet, continue at North 60 degrees West another 400 feet and then follow the ore 600 plus feet on a bearing of South 80 degrees West. Lateral drifts are to be driven from the two main haulage drifts and room and pillar development and mining of the orebody will be the same as at the Tony M. Initial development of the Frank M is scheduled to coincide with the phase out of the Tony M. Full production of the Frank M eventually will total 1,700 tons ore per day.

Mill Complex

Construction of the Shootaring Canyon processing facility began on September 21, 1979, after lengthy siting and environmental studies requiring approvals by the US Nuclear Regulatory Commission. The new facility has a design capacity of 750 tons ore per day; however, the operating capacity could be increased to about 1000 tons ore per day with limited modification.

The mill utilizes a conventional process common throughout the uranium industry. The primary mill circuit involves semi-autogenous grinding of the sandstone ores, followed by dissolution of the uranium from the finely-ground material with the use of sulfuric acid. The uranium-rich acid solution is separated from the leached sands in a six-stage counter-current decantation proces. The waste sands are discharged as tailings to an open impoundment site. The tailings storage site has been prepared below grade for gravity flow; in addition, the site was prepared with a clay sealed base to prevent seepage of radioactive material. A unique under-drainage system was installed to drain the tailings liquid from the slurry to reduce the hydraulic head on the clay liner, thus reducing the probability of underground seepage.

Uranium in solution is transferred from the aqueous acid phase to an organic phase by a solvent extraction process. Ammonium sulfate is used to remove the uranium from the organic phase, followed by uranium precipitation with the injection of ammonia gas. The final precipitate (yellowcake) is further washed, dried and packed into 55 gallon drums. When the mill reaches full production capacity, the work force will total approximately 50 employees. Figure 3 is a photograph of the milling facilities.

Townsite Preparation

The Shootaring Canyon project is located in a remote section of southeast Utah. Because only one established community exists within a 100 mile radius of the project area, Plateau was faced with the problem of arranging housing and other accommodations for workers and their families near the project site. When the project is in full operation, the Company will employ approximately 210 people at the site and about 40 in the administrative group located at Grand Junction, Colorado.

Plateau decided to overcome the problem by building a town near the project. A subsidiary of Plateau entered into a joint venture with Ticaboo Development Inc. for that purpose. The resulting union, the Ticaboo Townsite Joint Venture, undertook to plan and develop the community of Ticaboo.

The new community is situated on a 640 acre, state-owned tract along the eastern edge of Ticaboo mesa. The joint venture secured a lease from the state of Utah which gives it the exclusive right to develop a community on the selected site. A master plan designed for the Ticaboo community includes single and multiple-family dwellings, a mobile home park, medical facilities, a commercial area and a community services area. Phase 1 of the development, completed about mid-1981, consists of roads, sewer, water and electric power distribution facilities, housing and trailer sites, commercial facilities and support school, medical and maintenance facilities. Phase 2 will involve additional development as population growth requires. The population of Ticaboo could reach 700 to 800 by the time the project is operating at full capacity.

Orebody Geology

The uranium deposits in the Shootaring Canyon area are confined to fluvial sand facies in the Salt Wash Member of the Morrison Formation of Jurassic age. Typically, the Salt Wash consists of interbedded coarse to fine sandstone and mudstone units. The sandstones form up to seven distinct units, often referred to as "rims" by the miners. The rims often coalesce into three thick, channel-filling units recognized by the miners as favorable host rock for uranium/vanadium mineralization.

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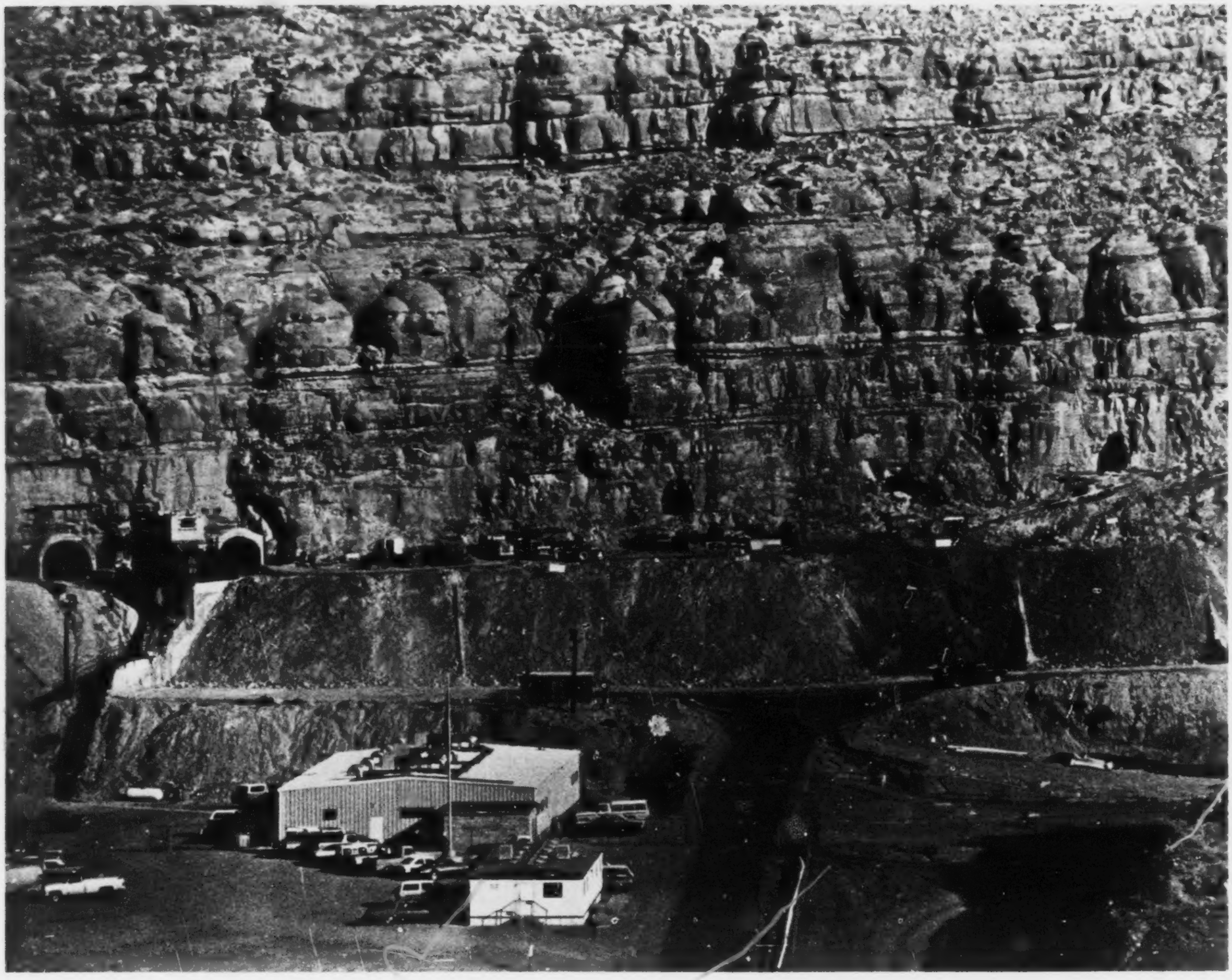

Figure 2

SHOOTARING CANYON MINE SITE. THE PORTALS OF THE EAST & WEST ACCESS DRIFTS ARE LOCATED ON THE LEFT. ORE REACHES THE SURFACE VIA THE EAST DRIFT AND IS DUMPED IN THE STORAGE BINS ACCORDING TO ROYALTY OBLIGATION. THE BUILDING HOUSES MINE OFFICES, CHANGE ROOMS AND SUPPORT FACILITIES. NOTE OLD MINE PORTALS AT RIGHT CENTER.

© NUEXCO 1982

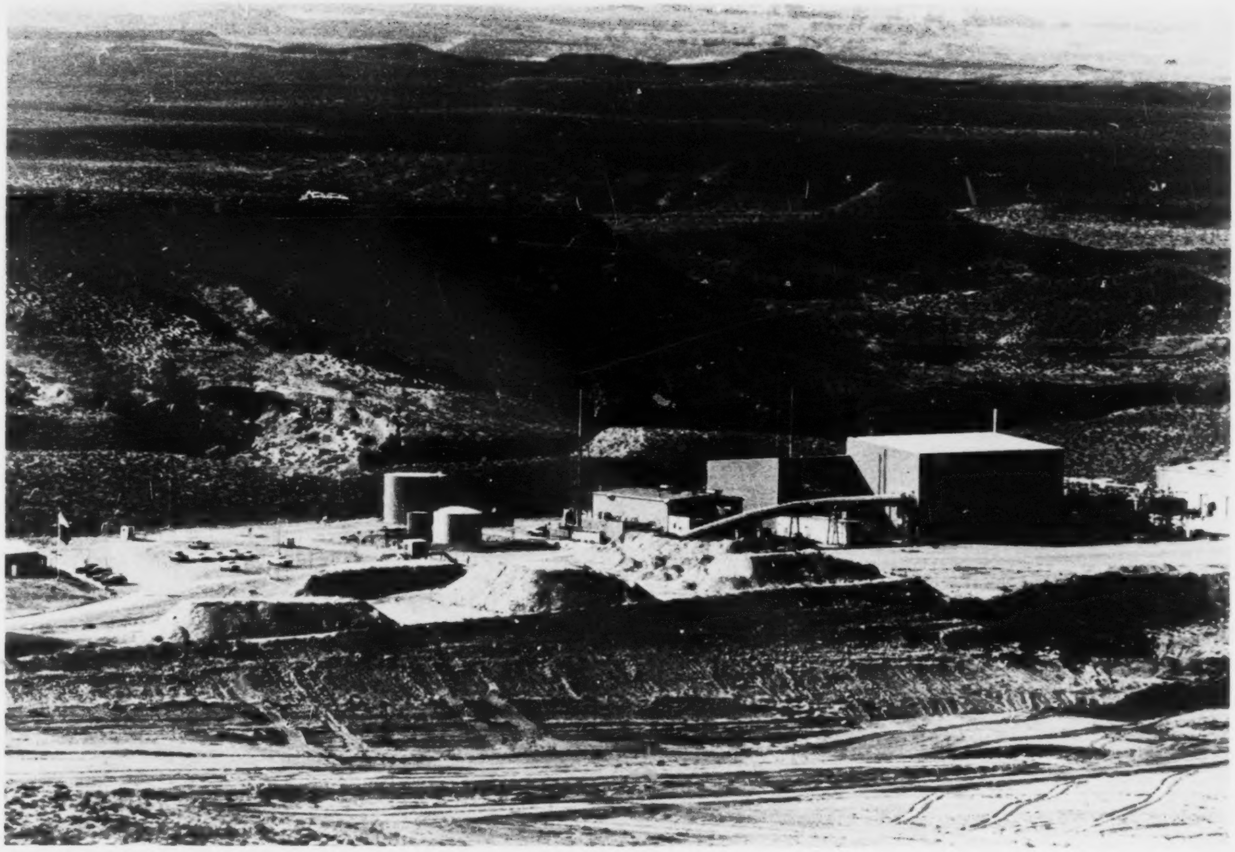

Figure 3

SHOOTARING CANYON MILL SITE SHOWING
ORE STOCKPILE AREA AND MAIN MILL BUILDINGS

© NUEXCO 1982

Outside the Henry Mountain district, a large percentage of ore occurs in the uppermost portion of the three rims. However, the Shootaring Canyon deposits occur in the lower portion of the massive bottom rim. The ore is confined to two horizons within the 400 to 500 foot thick channel sandstone. The ore in the Tony M mine area occurs within a 30 foot zone directly above the base of the lower rim, which in turn overlies the Tidwell Member of the Morrison Formation. Ore in the Frank M mine area occurs 60 to 100 feet above the base of the Salt Wash. Figure 4 shows the relationship of the ore zones at Shootaring Canyon to the stratigraphy of the district.

The ore deposits are usually tabular and elongated parallel to the sedimentary trend of each sandstone unit. The geologic structure of the area is characterized by a gentle northwesterly dip of two to five degrees. No faulting or other structural irregularities are known to occur in the vicinity of the ore deposits.

The most abundant uranium ore mineral identified in the unoxidized zone is coffinite, a uranium silicate, followed by uraninite, a uranium oxide. Carnotite is the most common mineral occurring in the oxidized zone. It is a uranium vanadate and it is often associated with montroseite, the most important vanadium mineral present. Uncharacteristically of most Salt Wash ores, the Shootaring Canyon deposits contain only minor amounts of vanadium.

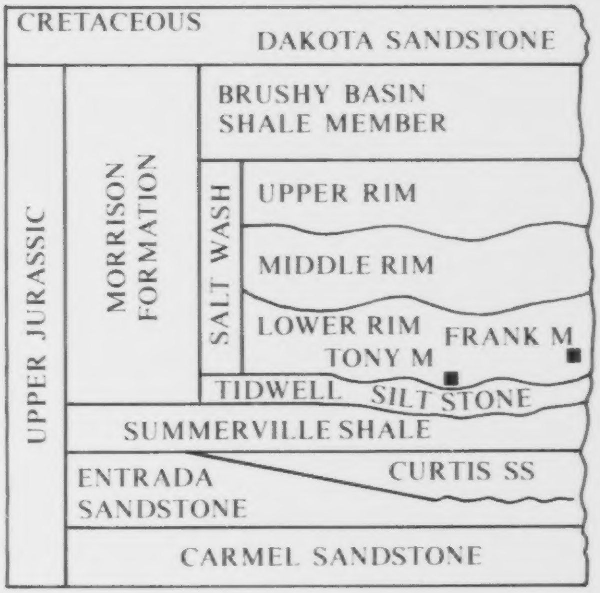
CRETACEOUS
DAKOTA SANDSTONE
UPPER JURASSIC
MORRISON FORMATION
BRUSHY BASIN SHALE MEMBER
SALT WASH
UPPER RIM
MIDDLE RIM
LOWER RIM
FRANK M
TONY M
TIDWELL SILT STONE
SUMMERVILLE SHALE
ENTRADA SANDSTONE
CURTIS SS
CARMEL SANDSTONE

Figure 4

GENERALIZED STRATIGRAPHIC SECTION OF THE URANIUM-BEARING SALT WASH RIMS AT SHOOTARING CANYON; ORE HORIZON HIGHLIGHTED

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STATISTICAL DATA

EXCHANGE VALUE $23.00/lb. U_3O_8
Determined as of January 31, 1982

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

TRANSACTION VALUE
Determined as of January 31, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
24.00	2.8	20	5

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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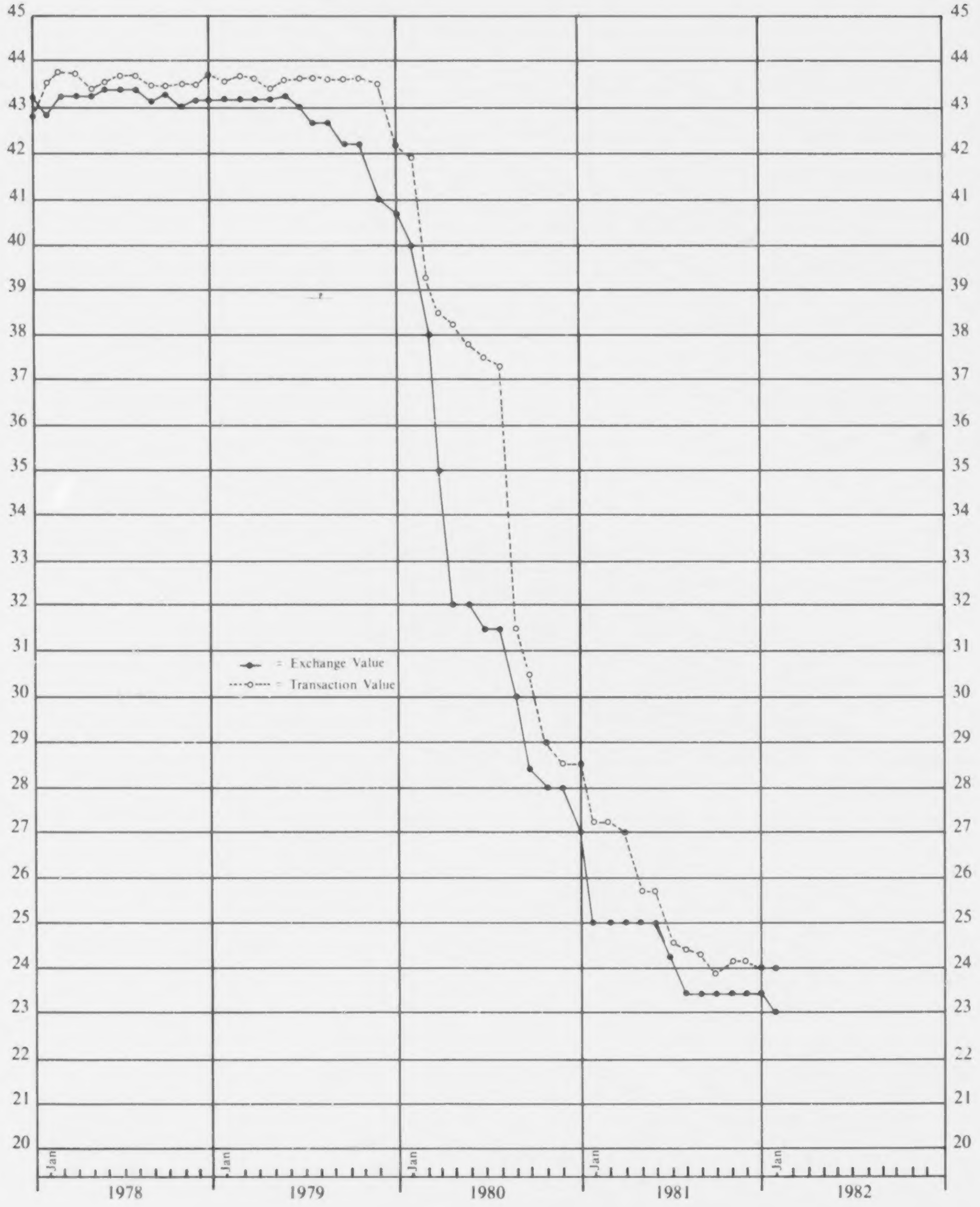
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00											

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00											

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES*

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	23.00	50.71	59.79
France (franc)	136.01	299.86	353.61
FRG (mark)	53.48	117.89	139.03
Japan (yen)	5,303	11,692	13,787
Switzerland (franc)	42.71	94.16	111.04
UK (pound)	12.25	27.00	31.84
Australia (dollar)	20.90	46.07	54.32
Canada (dollar)	27.57	60.78	71.67
Niger, Gabon (CFA)	6,805	15,002	17,691
South Africa (rand)	22.38	49.35	58.19
Sweden (kröner)	130.76	288.27	339.94

*Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of January 31, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.

B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE 6%
Determined as of January 31, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.

B. Rates included in firm proposals to borrow or lend.

C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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STATISTICAL DATA

HISTORICAL LOAN USE CHARGE RATE

Determined as of the last day of the month indicated (percent per annum)

1968

Report No.	Month	Rate for Return Before 1/1/71
01	Aug	4.0%
02	Sep	4.0%
03	Oct	4.0%
04	Nov	4.0%
05	Dec	4.0%

1969

Report No.	Month	Rate for Return Before 1/1/71
06	Jan	4.0%
07	Feb	4.0%
08	Mar	5.0%
09	Apr	5.0%
10	May	5.0%
11	Jun	5.0%
12	Jul	5.0%
13	Aug	5.0%

Report No.	Month	Rate
14	Sep	6.0%
15	Oct	6.0%
16	Nov	6.0%
17	Dec	6.0%

1970

Report No.	Month	Rate
18	Jan	6.0%
19	Feb	6.2%
20	Mar	6.4%
21	Apr	6.5%
22	May	6.5%
23	Jun	6.5%
24	Jul	6.5%
25	Aug	5.0%
26	Sep	6.5%
27	Oct	6.0%
28	Nov	5.5%
29	Dec	5.5%

1971

Report No.	Month	Rate
30	Jan	5.0%
31	Feb	4.75%
32	Mar	4.75%
33	Apr	4.75%
34	May	5.0%
35	Jun	5.25%
36	Jul	5.25%
37	Aug	5.25%
38	Sep	5.25%
39	Oct	5.25%
40	Nov	4.5%
41	Dec	4.5%

1972

Report No.	Month	Rate
42	Jan	4.0%
43	Feb	4.0%
44	Mar	4.0%
45	Apr	4.5%
46	May	4.5%
47	Jun	4.5%
48	Jul	5.0%
49	Aug	5.0%
50	Sep	5.0%
51	Oct	5.0%
52	Nov	5.0%
53	Dec	5.0%

1973

Report No.	Month	Rate
54	Jan	5.5%
55	Feb	5.5%
56	Mar	5.75%
57	Apr	5.75%
58	May	6.00%
59	Jun	6.25%
60	Jul	7.00%
61	Aug	7.00%
62	Sep	7.00%
63	Oct	7.00%
64	Nov	7.5%
65	Dec	8.00%

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STATISTICAL DATA

1974

Report No.	Month	Rate
66	Jan	8.00%
67	Feb	8.00%
68	Mar	8.00%
69	Apr	8.00%
70	May	8.00%
71	Jun	8.00%
72	Jul	8.00%
73	Aug	8.00%
74	Sep	8.00%
75	Oct	8.00%
76	Nov	8.00%
77	Dec	8.00%

1975

Report No.	Month	Rate
78	Jan	8.00%
79	Feb	7.00%
80	Mar	7.00%
81	Apr	7.00%
82	May	7.00%
83	Jun	6.50%
84	Jul	6.50%
85	Aug	6.50%
86	Sep	6.50%
87	Oct	6.50%
88	Nov	6.50%
89	Dec	6.50%

1976

Report No.	Month	Rate
90	Jan	6.5%
91	Feb	6.5%
92	Mar	6.5%
93	Apr	6.5%
94	May	Floats with prime rate
95	Jun	Floats with prime rate
96	Jul	Floats with prime rate
97	Aug	Floats with prime rate
98	Sep	Floats with prime rate
99	Oct	Floats with prime rate
100	Nov	Floats with prime rate
101	Dec	Floats with prime rate

1977

Report No.	Month	Rate
102	Jan	Floats with prime rate
103	Feb	Floats with prime rate
104	Mar	Floats with prime rate
105	Apr	Floats with prime rate
106	May	6.50%
107	Jun	6.50%
108	Jul	6.50%
109	Aug	6.75%
110	Sep	7.25%
111	Oct	7.25%
112	Nov	7.25%
113	Dec	7.25%

1978

Report No.	Month	Rate
114	Jan	7.25%
115	Feb	7.00%
116	Mar	7.00%
117	Apr	7.00%
118	May	7.00%
119	Jun	7.50%
120	Jul	7.75%
121	Aug	7.75%
122	Sep	7.75%
123	Oct	7%
124	Nov	7%
125	Dec	7%

1979

Report No.	Month	Rate
126	Jan	7%
127	Feb	7%
128	Mar	7%
129	Apr	7%
130	May	7%
131	Jun	7%
132	Jul	7%
133	Aug	7%
134	Sep	7%
135	Oct	7%
136	Nov	7.0%
137	Dec	7.0%

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STATISTICAL DATA

1980			1981		
Report No.	**Month**	**Rate**	**Report No.**	**Month**	**Rate**
138	Jan	7.0%	150	Jan	7.0%
139	Feb	7.0%	151	Feb	7.0%
140	Mar	7.0%	152	Mar	7.0%
141	Apr	7.0%	153	Apr	7.0%
142	May	7.0%	154	May	7.0%
143	Jun	7.0%	155	Jun	7.0%
144	Jul	7.0%	156	Jul	5½%
145	Aug	7.0%	157	Aug	5½%
146	Sep	7.0%	158	Sep	5½%
147	Oct	7.0%	159	Oct	5½%
148	Nov	7.0%	160	Nov	6%
149	Dec	7.0%	161	Dec	6%

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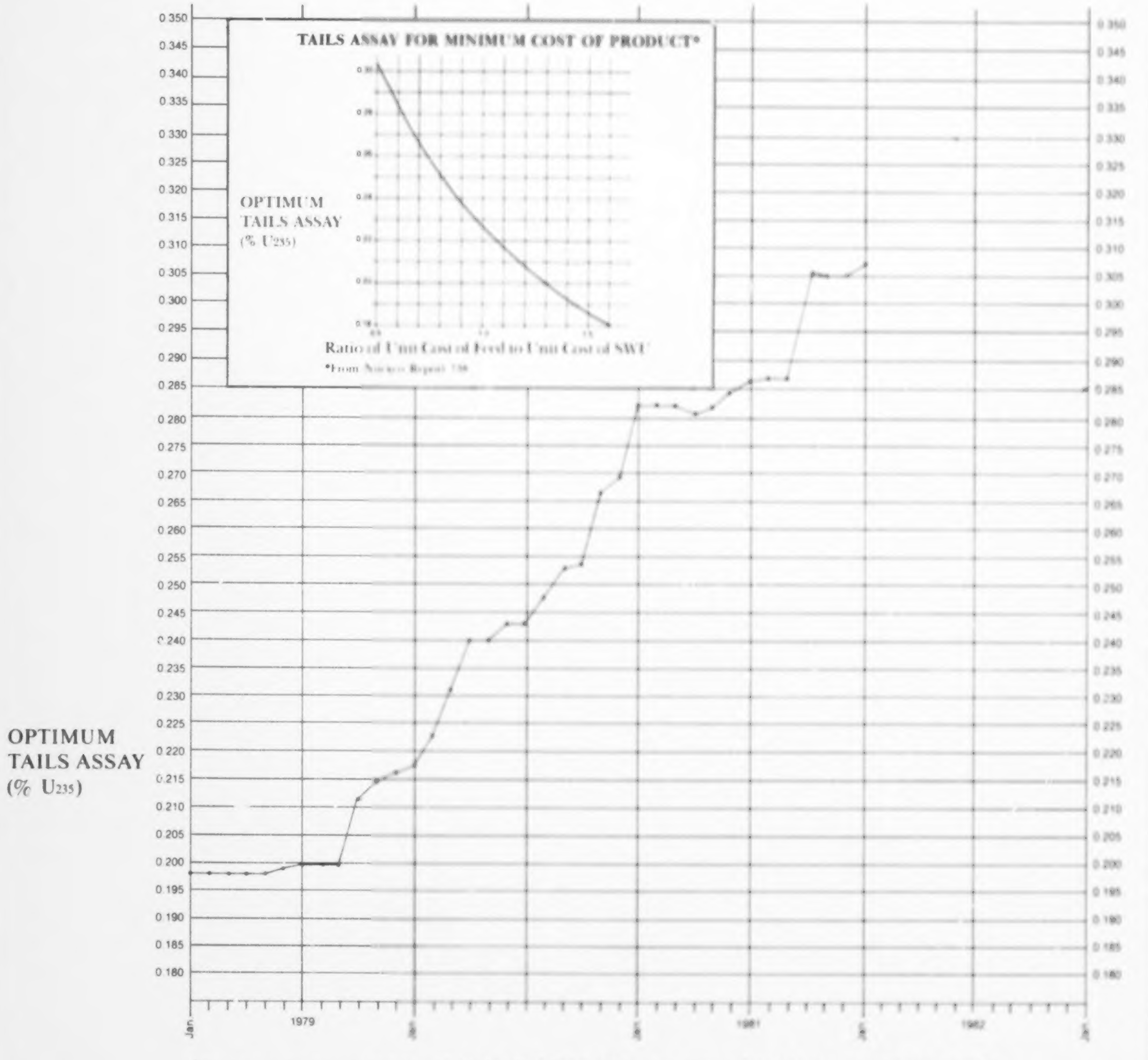
STATISTICAL DATA

OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	—	—	—	193.58	—	—	—	—
Feb 1981	295.7	287.6	263.2	—	11.15	11.36	8.80	7.43
Mar 1981	299.6	290.3	265.1	188.14	11.13	11.50	8.84	7.47
Apr 1981	303.5	293.4	266.8	—	11.30	11.63	8.94	7.51
May 1981	304.7	294.1	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1	294.8	271.3	191.06	11.31	11.88	9.07	7.50R
Jul 1981	306.2	296.2	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.2R	296.4R	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	309.2R	295.5P	279.3	195.61	12.11	12.68	9.38	7.79
Oct 1981	308.8P	296.0P	279.9	—	12.12P	12.46P	9.34P	7.84P
Nov 1981	309.1P	295.5P	280.7	—	12.19P	12.47P	9.39P	7.87P
Dec 1981	310.1P	295.9P	281.5	199.58	—	—	9.47P	7.98P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1970[3]	101.4	59.88
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00
Sep 1980	350.3	219.60
Oct 1980	348.2	221.07R
Nov 1980	350.4	221.44R
Dec 1980	351.7	222.35R
Jan 1981	357.8	230.53R
Feb 1981	356.6	230.35R
Mar 1981	355.2	229.60R
Apr 1981	354.6	229.32R
May 1981	353.4	237.24R
Jun 1981	360.4	237.56R
Jul 1981	357.5	237.42R
Aug 1981	360.3	237.42R
Sep 1981	357.8	237.38R
Oct 1981	352.0P	238.65R
Nov 1981	350.8P	340.30P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Sep 1980	252.0	10.85	8.24	8.71
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.8	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3	11.27	8.51	8.90
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.5	11.47	8.63	9.17
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0R	11.99R	8.90	9.49
Jun 1981	272.3R	12.03R	9.16	9.57
Jul 1981	274.3R	12.07R	9.20	9.62
Aug 1981	276.0	12.19R	9.15R	9.63R
Sep 1981	276.7R	12.41P	9.22P	9.77P
Oct 1981	278.6R	12.75P	9.34P	9.95P
Nov 1981	278.2P	—	—	—

P = Preliminary   R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1970[3]	7.34	100.3[4]	—	655,346	399,164
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Sep 1980	36.19	182.8	199.8	710,889	204,761
Oct 1980	—	186.3	203.1	720,246	204,602
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6R	724,604R	251,502R
Oct 1981	—	216.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	—	—
Dec 1981	44.52	216.3	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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EXECUTIVE SUMMARY
NUEXCO REPORT 162

Exchange Value Decreases 50 Cents to $23.00

The **Exchange Value** as of January 31, 1982 is $23.00 per pound U_3O_8. The decline of 50 cents from the $23.50 level of the past six months reflects recent and pending transactions at lower prices and an increase in the amount of material available for sale. Buyers are few and they have become more selective, sensing a weakening market.

Near Term Supply Increases

Additional sellers entered the spot and near-term markets during January, offering substantial amounts of material. Material available for sale in the zero to one year time frame totals 10.1 million pounds U_3O_8. Uranium demand in the same time period totals four million pounds U_3O_8. Material offered by inventory holders represents 60 percent of the total material for sale in the spot and near term. Material being sought by non-primary users represents two-thirds of the total material under inquiries to purchase in the same time period.

Transaction Value $24.00, Unchanged

The **Transaction Value** as of January 31, 1982 is $24.00 per pound U_3O_8 for the second consecutive month. Twenty transactions totaling 2.8 million pounds U_3O_8 and covering a period of five months are included.

Conversion Value Remains at $1.20

The secondary market for conversion services was quiet during January. The **Conversion Value** held steady at $1.20 per pound U as UF_6. One secondary market conversion transaction is reported.

1981 Transactions Tabulated

The totals of all transactions reported by Nuexco during 1981 are presented, with a breakdown by delivery year. A weighted average of prices for 1981 transactions is discussed.

UEGA Activities Highlighted

The Uranium Enrichment Group of Australia is currently studying various enrichment technologies with a decision expected in a few months. A full feasibility study will follow the selection.

Australia and Japan Initial Bilateral

After three and one-half years of negotiations, officials of the Japanese and Australian governments initialled a bilateral safeguards agreement. However, there are conflicting reports as to the content of the agreement.

1981 World Production Totals

1981 world uranium production was essentially the same as in 1980. The distribution changed somewhat; Canadian and Australian output increased enough to effect a 14 percent drop in US production.

Quantitative Factors Affecting Uranium Prices Reviewed

During the past year, Nuexco published a series of analyses discussing quantitative factors which affect uranium prices. A review of some of the analyses is presented in the *Market Analysis* section.

Long-term Contracting Discussed

This month's *Essay* analyzes the problems of pricing long-term contracts and discusses the various methods used and their potential drawbacks.

Plateau Resources' Shootaring Canyon Project Presented

The *Raw Materials* section focuses on the development of the Shootaring Canyon project, now scheduled for uranium production later this year.

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MARCH 1982 NUMBER 163

Monthly Report on the Uranium Market

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March 1982 No. 163

R. WESLEY MILLER, *EDITOR*

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NOTICE

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FOREWORD

We are pleased to announce that Mr. Robert J. Alexander is joining Nuexco this month as Fuel Cycle Consultant. Bob will be assisting Dick Andersen in expanding the capabilities of our Consulting Services Division.

Bob's previous employment was with American Electric Power Company and Portland General Electric Company, where he was actively involved in all aspects of the nuclear fuel cycle. He holds B.S. and M.S. degrees in Engineering from the Georgia Institute of Technology and the New Jersey Institute of Technology, respectively, and an M.B.A. degree from New York University.

Nuexco will host a hospitality suite during the Atomic Industrial Forum's Fuel Cycle Conference '82. The suite will be at the Grand Hyatt New York in New York City, March 21-24.

Beginning with Report No. 162, the Report's index format was changed. A detailed index will now be printed for each Report in the subsequent issue. The index for Report 162 appears on page 26 of this Report. In addition, a comprehensive index for the previous year will be printed in each year's first Report. We hope that this index method will enable our readers to more easily locate specific articles and information.

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MARKET ACTIVITIES

PRICING

The **Exchange Value** as of February 28, 1982, is $23.00 per pound U_3O_8, unchanged from last month. The ratio of near-term supply to near-term demand for uranium increased somewhat, from 2.5:1 in January to 3.3:1 this month.

There are 10.9 million pounds U_3O_8 equivalent available for sale during the next 12 months, as indicated in the *Market Data* section of this Report. However, it should be noted that not all of this material is available for immediate delivery; nor is all of it available in the form of U_3O_8; nor is all of it US origin; nor is all of it available at the same conversion facility; nor is all of it for sale at $23.00 per pound U_3O_8.

As a consequence, it is not always possible for a buyer to obtain material at Exchange Value when the buyer also insists on other specifics. For example, a willing buyer and a willing seller may agree on a price of $23.00 per pound U_3O_8 for near-term delivery. However, the buyer may also insist on:

1. U_3O_8, as opposed to UF_6.
2. Canadian origin.
3. Delivery at Kerr-McGee.
4. Book transfer.
5. On April 13, 1982.

In such a situation, the seller in question may not be able to meet all of the buyer's very specific requirements. The buyer or seller may be forced to incur significant costs in time and money to overcome the mismatches. It may even be necessary to find a different seller altogether.

The **Transaction Value** as of February 28, 1982 is $23.70 per pound U_3O_8, down $0.30 from January. February's Transaction Value includes 14 transactions totaling 2.2 million pounds U_3O_8 and covers a period of three months.

There are four uranium sales transactions reported this month:

1. A US utility sold 301 thousand to 600 thousand pounds U_3O_8 to a US producer for delivery in the first half of this year.
2. A US producer sold 301 thousand to 600 thousand pounds U_3O_8 to another US producer for delivery in the first half of this year. The contract provides for unusually liberal payment terms.
3. A US utility sold 101 thousand to 300 thousand pounds U_3O_8 to a US producer for delivery in the first half of 1982.
4. A European entity sold 601 thousand to one million pounds U_3O_8 to a US producer for delivery during 1982 and 1983.

Another transaction in the 100-300 thousand pound range is rumored but could not be verified at publication date.

The **Loan Use Charge Rate** remained at six percent. There are indications that, in the near future, additional material may become available for loan at this level.

The **Conversion Value** as of February 28, 1982 is $1.20 per pound U as UF_6, unchanged from last month. Although no secondary market transactions were concluded during February, several are under discussion at price levels consistent with the Conversion Value.

DOE SWU Price Increase

DOE has announced the new separative work prices for deliveries beginning August 21, 1982. The price under Adjustable Fixed Commitment and Long Term Fixed Commitment contracts will be $138.65/swu. The price under Requirements contracts will be $149.85/swu, although this will probably be limited by the ceiling price. The current ceiling price for Requirements contracts is $138.57/swu; the new ceiling price, yet to be determined, will become effective on July 1 of this year.

It is now DOE policy to announce its prices for enrichment services so that they become effective about August 20 of each year. The future announcements will probably be made in late February of each year, to allow the required 180 days' notice before the new prices become effective. As before, the ceiling price for Requirements contracts will be recalculated to become effective on January 1 and July 1 of each year.

AUSTRALIA

Just two weeks after it declared its first dividend since 1964, Mary Kathleen Uranium Ltd. (MKU) announced that it will close its mine next September. The mill will be closed three months later. The mine was rehabilitated in 1976, after a 13-year closure. The recent announcement was not unexpected, since the company has stated in the past that operations would be extended only if additional economic reserves were found. MKU had been involved in an extensive exploration program to find further reserves.

MKU will continue shipping yellowcake from inventory for some time to fulfill contractual obligations. In making this decision, the company is leaving unmined some 1,200 tonnes of contained uranium. That material, together with a stockpile of low grade ore, does not justify new sales contracts at prices lower than the

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company's present operating costs.

Energy Resources of Australia (ERA), operator of the Ranger uranium mine, reported profits of US$ 8.9 million on uranium sales revenues of US$ 41 million in the second half of 1981. The plant was completed on October 1, 1981, so the profits reflect only three months of uranium production. During this period, output slightly exceeded design capacity. Township development and some minor plant items still require some capital expenditure.

Development of the Roxby Downs copper-uranium project has become the most contentious issue in South Australia's state politics. In the next few weeks, state politicians will have to decide whether to allow the project to proceed by passing the indenture bill in Parliament. The bill sets forth the conditions for development, mining rights and infrastructure arrangements. The strong anti-uranium position taken by the opposition parties (Australian Labor Party and Australian Democrats) could seriously affect the timetable of the venture.

The Australian "Synroc" process for solidifying nuclear wastes, developed and patented by the Australian National University, is consistently surpassing expectations at rigorous tests conducted by the Australian Atomic Energy Commission (AAEC). Synroc is also under examination by senior officials of the US nuclear program, and according to AAEC reports, has been selected as the standard method for high level waste disposal of the US fast breeder program.

According to the Director of the AAEC, its efforts to develop an Australian uranium enrichment process have shown that the use of local technology may become a definite option in plans for an Australian enrichment plant. The Uranium Enrichment Group of Australia (UEGA) is currently considering French, American and European techniques. The pre-feasibility study completed in May 1981 concluded that the local centrifuge technology was sound, but that Australian manufacturing capacity was limited. It admitted that some features of the AAEC technology could be integrated with overseas technology to mutual advantage.

EUROPE

Recently, a public opinion poll conducted in **Switzerland** about national plans for handling the storage of radioactive waste indicated that:

1. 68 percent of those polled believe the National Institute for the Storage of Radioactive Waste (NAGRA) is competent to handle the problem.
2. 62 percent support the drilling program proposed by NAGRA to help select the best site for the disposal facility.
3. 57 percent are convinced that safe underground storage of radioactive wastes is technically feasible.
4. 30 percent oppose the overall NAGRA program.
5. 29 percent oppose the NAGRA proposed drilling program.

In February, the Swiss government granted NAGRA a license to bore eleven test holes in specific areas to determine the geological suitability for underground storage of radioactive waste. Plans call for starting drilling early this summer, probably in the canton of Zurich or Argau. The complete program of drilling and evaluation is scheduled to be completed by 1985.

In **West Germany**, the nuclear power program recently received much needed support in two different areas:

1. The Federal Ministry of the Interior approved the beginning of construction on three light water reactor projects, namely Biblis Unit C, Isar Unit 2 and either Hamm or Elmsland. The Ministry approval is a prerequisite for the local state authorities to endorse the start of construction on any nuclear reactor project in their respective areas.

The Bavarian state authorities will probably give their approval this month for the start of construction for the Isar Unit 2 project. However, state approval for Biblis Unit C may be delayed by the local authorities, as there are some local political differences to be resolved first.

2. The Federal Government gave unofficial assurance to the utilities that the government would eventually grant an operational license to the SNR-300 (Kalkar) fast breeder reactor project, provided certain defined technical criteria were met. As a result, the utilities in mid-February increased their pledge of financial support by approximately one billion DM.

Although the official government decision on the project is not expected before this summer, additional utility financial support was needed now to keep the project alive. Since the utilities had refused to commit more money without assurance that the plant could be eventually licensed, the project's future appeared in doubt until the compromise was reached. The project is scheduled to be operational sometime between 1985 and 1987.

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MARKET ACTIVITIES

FAR EAST

On January 26, **Japan's** Ministry of International Trade and Industry issued a construction permit to Japan Atomic Power Co. (JAPC) for its Tsuruga Unit 2, a 1,160 MWe PWR. JAPC's permit application was submitted in March, 1979, but authorization was delayed because of the TMI incident and more recently because of last year's radwaste leak at JAPC's Tsuruga plant. Construction work on Unit 2 is scheduled to begin in April and commercial operation is now slated for June, 1987. JAPC's original target was a March, 1986 commercial operation date.

The construction permit followed closely upon an announcement by the JAPC president of the utility's financial difficulties. The financial problems are largely due to the cost of rebuilding the contaminated radwaste facility and also because of the money paid as compensation to local residents affected by the Tsuruga incident. A detailed look at the Tsuruga incident and its effects appears in the *Market Analysis* section of this report.

UNITED STATES

Construction delays and financial difficulties continue to plague US utilities:

1. Public Service Company of Oklahoma (PSO) cancelled its two-unit Black Fox Station Nuclear Project. The licensing application, pending before the NRC since 1975, was withdrawn primarily due to financial considerations and extensive delays in construction.

A consultant to the Oklahoma Corporation Commission has recommended the construction of a coal-fired plant instead. PSO's parent company, Central & South West Corp., is still considering its options.

2. Houston Lighting & Power Co. (HL&P) is reconsidering its plans to build its one-unit Allens Creek nuclear generating unit. The plant, first planned as a two-unit station, was once scheduled to come on line this year at a total cost of $1.2 billion. HL&P now estimates it would cost more than $2 billion to complete just one unit by 1991. Like Public Service Company of Oklahoma, Houston is considering, among other options, using the site for a coal unit. Last November, Standard & Poor's lowered its ratings on HL&P securities from AA to A due to economic and construction scheduling uncertainties associated with the project.

3. Moody's Investors Service lowered its bond rating on Washington Public Power Supply System (WPPSS) Units 1, 2 and 3 from AAA to AA. Again, extensive delays in construction and economic factors influenced the decision. On the other hand, a recent WPPSS bond offering was received so well by investors that it was increased from $500 million to $850 million.

Rochester Gas & Electric expects to resume operations at its Ginna unit on May 1 after a three-month shutdown to repair steam generator tubes damaged in the January loss of coolant accident. Final damages have not yet been determined, but are expected to exceed the utility's $1 million insurance deductible limit.

Recent developments among US uranium producers:

1. Western Nuclear reduced mining and milling operations to four days a week at its three uranium mining and milling operations. The cutbacks affect the Smith Lake mine near Grants, New Mexico, the milling of stockpiled ore at Jeffrey City, Wyoming and the Sherwood operation in Washington.

2. Exxon transferred all mineral geologists at its Albuquerque office to the oil and gas division effective February 1, 1982.

CORRECTION

Last month's Nuexco Report 162 stated incorrectly that "Southern California Edison's San Onofre Unit 2 was licensed for fuel loading and low power testing by the NRC last month." The article should have stated that, since the *Atomic Safety and Licensing Board* had given its approval for fuel loading and low power testing, the NRC could be expected to issue a license for fuel loading and low power testing within the next few weeks.

On February 16, 1982, the NRC did issue a license for Southern California Edison to load fuel and test its San Onofre Unit 2 up to five percent power. Hearings concerning the plant's preparedness to meet emergency standards will be required before the plant is allowed to operate at full power.

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MARKET DATA

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U$_3$O$_8$)			Remarks
	0 to 1 Year	1 to 2 Years	2 to 5 Years	
Available for Sale:				
1475	1,500			UF$_6$
1490	1,000			
1575			500	Long Term
1581	150	150	150	Long Term
1584	500			
1610	200			
1637	500			
1684	500			UF$_6$
1738	750			UF$_6$
1739	600	750	750	Long Term
1774	50			
1804	615			
1805	500	500	500	Long Term
1807	700			
1810		750		
1812A	1,000			
1814	250			
1818		250	250	Long Term
1872	250			
1875A	350	350		
1877	50			
1895	1,400			UF$_6$
TOTAL:	10,865	2,750	2,150	
Available for Loan:				
1695	225	325	325	UF$_6$
1742	200			
1785	1,000			
1815	1,000			UF$_6$
TOTAL:	2,425	325	325	

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[1] Measured from the date of this Report

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MARKET DATA

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8			Remarks
	0 to 1 Year	1 to 2 Years	2 to 5 Years	
Inquiries to Purchase:				
1410		1,500	1,500	
1459			200	Long Term
1603			100	Long Term
1634		400		
1699	300	300	250	
1724	650	500	500	Long Term
1732	100			
1744	1,000			
1775	20			
1841	100			
1842			500	Long Term
1868	300	200	200	Long Term
1875	350	350		
1888			500	Long Term
1889			500	Long Term
1891	500			
TOTAL:	3,320	3,250	4,250	
Inquiries to Borrow:				
1621	300			
1780	500			
1812	1,000			
1885	600			
1890	500			
TOTAL:	2,900			

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[1] **Measured from the date of this Report.**

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MARKET DATA

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 5 Years	Remarks
1451	75			
1584	350	300	300	Long Term
1607	1,000			
1609	500	1,500	1,000	Long Term
1619		250	50	
1661	200			
1684	450			
1764	100			
1840	200			
1886	500			
TOTAL:	3,375	2,050	1,350	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 5 Years	Remarks
1594		400	950	Long Term
1622	500	900		
TOTAL:	500	1,300	950	

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[1] **Measured from the date of this Report**

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1670	82-83	601-1,000	98	Europe	US	
1709	82	101-300	98	US	US	
1715	82	301-600	102	US	US	
1717	82	301-600	100	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks

None reported.

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[1] Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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MARKET ANALYSIS

NUCLEAR POWER PROGRESS IN 1981

While the US nuclear power industry suffers negative order rates year after year, the rest of the world progresses.

Total nuclear electric power generation for North America, Western Europe and the Far East in 1981 is shown in Table 1; the corresponding figures for 1980 are shown for comparison. Nuclear generation of electricity in 1981 for the three regions increased 16 percent over 1980 to 706 million megawatt-hours. The biggest increases occurred in France and the US, but Sweden, Finland and West Germany had large percentage increases as well.

France's nuclear generation of approximately 100 million megawatt-hours in 1981 was 60 percent higher than its 1980 output, due to the better-than-expected performance of EdF's plants and the startups of eight new nuclear units. More than 37 percent of the total French electricity production was supplied by nuclear power. In the US, nuclear generation of electricity increased by 24 million megawatt-hours, a nine percent increase over 1980.

Sweden's output increased by 33 percent over 1980. West Germany's output increased by 23 percent and Finland's nuclear generation in 1981 doubled that of 1980.

The sixteen nuclear reactors that started up during 1981 outside the US (excluding Communist areas) are listed in Table 2. Those reactors added approximately 13,800 MWe to the world's installed capacity. The US contributed only 3,363 MWe (Nuexco Report 161, Table 11) to the world total of approximately 17,000 MWe. More than forty percent of the total — 7,240 MWe — came from France. The 1981 total for France does not include Dampierre Unit 2 and Gravelines Unit B3, two reactors that started up in late 1980 and began commercial operations in early 1981.

Table 1

NUCLEAR ELECTRIC POWER GENERATION
(millions of megawatt-hours, gross)

	1980	1981
North America		
Canada	40	43
United States	265	289
Total North America	305	332
Western Europe		
Belgium	12	12
Finland	7	14
France	61	98
West Germany	44	54
Italy	2	2
Netherlands	4	4
Spain	5	10
Sweden	27	36
Switzerland	14	14
United Kingdom	37	33
Total Western Europe	213	277
Far East		
Japan	81	84
Taiwan	8	10
Republic of Korea	3	3
Total Far East	92	97
TOTAL	610	706

Table 2

POWER REACTOR STARTUPS OUTSIDE THE US IN 1981

Country	Plant	Type	Net MWe
France	Blayais 1	PWR	920
	Dampierre 3	PWR	900
	Dampierre 4	PWR	900
	Gravelines B4	PWR	920
	St. Laurent B1	PWR	880
	St. Laurent B2	PWR	880
	Tricastin 3	PWR	920
	Tricastin 4	PWR	920
Japan	Fukushima II-1	BWR	1100
	Genkai 2	PWR	559
	Ikata 2	PWR	566
Spain	Almaraz 1	PWR	930
Sweden	Forsmark 2	PWR	900
	Ringhals 3	PWR	900
Taiwan	Kuosheng 1	BWR	951
Yugoslavia	Krsko	PWR	615

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MARKET ANALYSIS

Table 3

POWER REACTORS ORDERED IN 1981

Country	Plant	Net MWe	Type	Estimated Startup
France	Belleville 1	1270	PWR	1986
	Belleville 2	1270	PWR	1987
	Chinon B3	875	PWR	1986
	Nogent 1	1270	PWR	1987
Japan	Hamaoka 3	1100	BWR	1985
	Kashiwazaki 5	1100	BWR	1989

Although the dividing line between firm orders and announced plans is sometimes blurred, Table 3 shows that six new orders were placed in 1981. France ordered four PWR units totaling approximately 4,700 MWe; Japan ordered two BWR units of 2,200 MWe each.

Table 4 indicates that ten reactors outside the US experienced construction schedule delays in 1981. The ten reactors involve a total of approximately 7,100 MWe. The average delay, weighted by size in MWe, was sixteen months.

The delays enumerated in Table 4 do not represent all that occurred during 1981. For example, delays of less than one year were ignored. Rather, the table indicates where the most significant delays occurred. Nuexco has knowledge of numerous delays not included in Table 4, but it is our policy not to reveal any confidential data about individual clients. Those delays are, however, factored into Nuexco's calculations of Apparent Future Consumption.

Table 4

NON-US POWER REACTOR PROJECTS DELAYED IN 1981*

Country	Plant	Net MWe	Type	From	Delayed To	Number of Months
India	MAPP 2	220	PHWR	3/82	/84	21
	NAPP 1	220	PHWR	12/83	/86	24
	NAPP 2	220	PHWR	12/84	/87	24
Italy	ENEL 8	982	BWR	12/85	2/87	14
Spain	Cofrentes	930	BWR	10/82	/84	14
	Almaraz 2	930	PWR	/82	6/83	12
	Asco 1	880	PWR	6/81	10/82	16
	Asco 2	880	PWR	6/82	3/84	21
	Lemoniz 1	900	PWR	12/81	6/83	18
Switzerland	Kaiseraugst	925	BWR	/89	/90	12

*Units delayed at least one year: determined by comparing the Commercial Operation Date (COD) listed in the December 31, 1980 Nuclear News World List of Nuclear Power Plants (published in February, 1981) with that listed in the December 31, 1981 list (published February, 1982). Also included are delays noted in 1981 publications but not included in the Nuclear News list.

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MARKET ANALYSIS

US IMPORT-EXPORT BALANCE

Table 5 sets forth Nuexco's estimate of current US import and export commitments for the period 1982-1991. The table includes:

1. Renegotiations of existing contracts.
2. Nuexco judgments as to the quantities that will be delivered under contracts now in force. For example, in some contracts subject to annual price negotiations, failure to agree on the new price terminates or suspends deliveries. In other contracts, the amount to be delivered is a function of production.
3. Nuexco judgments of the amounts of material which will be delivered under existing contracts presently in dispute.
4. Nuexco judgments of the amounts of material which will be delivered under the provisions of litigation settlements which have already been made. For example, some settlements include options, and other settlements were associated, in varying degrees, with production from certain production centers.

The analysis does *not* include commitments for US export or import which have not yet been made. It is important to note that Table 5 is *not* a forecast.

Table 5 shows only one year, 1985, in which US exports exceed imports. During the ten years covered by the analysis, Nuexco's estimate is that current commitments lead to cumulative net US imports of approximately nine million pounds U_3O_8. If the uranium market continues on its present trend, that figure must rise substantially over the next few years.

THE TSURUGA INCIDENT

After a six month suspension, Japan Atomic Power Co.'s (JAPC's) Tsuruga Unit 1 resumed commercial operation on January 22, 1982. The suspension resulted from a March 1981 spillage of radioactive waste which was concealed from the authorities until April.

On March 8, 1981, radioactive liquid waste overflowed from a filter sludge storage tank inside Tsuruga's radwaste building, seeped through openings and cracks in the floor, and was discharged into the sea through a general drain that runs under the building. The general drain carries rainwater and well water, and has no relation to sources of radioactivity, but the radwaste building, added in 1971, was constructed over this waterway.

The actual cause of the spill was operator error. After transferring sludge, the operator left cleaning water running. A new operator came on duty and did not check the water level of the storage tank in question. The following morning, the pump for drawing overflowing liquid waste from the floor began to work automatically and the alarm sounded. At that time, there was no one in the control room of the radwaste building, so there was

Table 5

US IMPORT-EXPORT BALANCE
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Imports										
Annual	6.1	5.4	5.2	2.5	2.7	1.8	2.0	2.0	1.9	1.4
Cumulative	6.1	11.5	16.7	19.2	21.9	23.7	25.7	27.7	29.6	31.0
Exports										
Annual	5.9	4.6	3.1	2.8	1.4	1.3	1.0	0.9	0.8	0.1
Cumulative	5.9	10.5	13.6	16.4	17.8	19.1	20.1	21.0	21.8	21.9
Net Imports/(Exports)										
Annual	0.2	0.8	2.1	(.3)	1.3	0.5	1.0	1.1	1.1	1.3
Cumulative	0.2	1.0	3.1	2.8	4.1	4.6	5.6	6.7	7.8	9.1

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no response. Later, an operator found a liquid waste leak on the floor. He traced it to its source and found that the cleaning water was still running. He closed the valve and built a dam with absorbent cloth to check the spread of liquid waste. Six JAPC operators were there from 4:15 p.m. to 6 p.m. on March 8 decontaminating the area. The maintenance subcontractor did decontamination work throughout the following week. The liquid waste overflow amounted to 14.5 to 15 cubic meters. Buckets and absorbent cloths were used to recover 13 cubic meters.

A total of 56 workmen, eight from JAPC and 48 subcontractors, took part in the 16-day decontamination process. However, JAPC did not report the incident to the proper government officials. Discovery of the radwaste leakage stemmed from environmental monitoring done monthly by the Research Laboratory of Public Health of Fukui Prefecture. The group took samplings of gulfweed from Urazoko Bay and found on April 17, 1981, that general drainage mixed with radioactive material flowed into the sea. The samples showed that radioactivity had increased from the previous month. The laboratory reported its findings to JAPC.

Subsequent samples taken in the plant vicinity by JAPC detected some radioactivity around the general waterway outlet adjacent to the seawater intake. JAPC reported these findings to the Agency of Natural Resources and Energy (ANRE) of MITI on April 17, 1981. In the course of the investigation by ANRE officers, they found that other incidents had also taken place at the plant which had neither been reported to the head office of JAPC nor to ANRE, the group responsible for the supervision of reactor plants. Specifically, three small leaks, two of cooling water and one of liquid waste, had occurred during January of 1981.

The media reported these accidents and charged the government with lack of supervision of reactor operation. JAPC was cited for failure to report the incidents and failure to comply with applicable safety regulations, especially the reporting obligation. The charge against the government revolved around MITI's approval for construction of the additional radwaste building despite the fact that the general waterway ran under the proposed new building.

Although the workers in the decontamination effort received no more than the permissible amount of radiation exposure, the public perceived that the workers were seriously injured from excessive exposure. Exaggerated reports by the news media fostered this public impression; the public's general lack of understanding about the differences between different types of radiation made them susceptible to the press reports. Also, many people believed that local sea products were totally contaminated by radioactive material despite an ANRE investigation which revealed that 26 species of fish taken from Tsuruga Bay all contained less than the minimum detectable amount of radioactive contamination.

On May 11, 1981, the Residents Association (in Fukui Prefecture) Against Nuclear Power Plants lodged a legal complaint against the president of JAPC and the site manager of the Tsuruga plant, charging them with violating the Reactor Regulation Law and Electric Utility Law. This marked the first time in the history of Japanese nuclear power development that a complaint had been filed with prosecution authorities relating to a nuclear power plant accident.

After the disclosure of the incidents, JAPC submitted a 65-page report to ANRE setting out the results of its investigation. The report cited the lack of a clearly defined system of reporting at the Tsuruga plant as one reason for the incident. The report also acknowledged that a more thorough study of the design and construction of the new radwaste building should have been done, particularly to coordinate the new and old facilities.

Regarding future improvements, the report stressed that: 1. proper attention would be given to any expansion or repair of buildings; 2. the warning system in the radwaste building would be improved, connecting it to and displaying it in the central control room.

Following the submittal of the report to ANRE, JAPC's eight top officers, including President T. Suzuki, resigned from the company. The eight top management positions were filled at a meeting of the Board of Directors.

Based on the JAPC report, ANRE prepared its own study and submitted it to Japan's Nuclear Safety Commission. The report recommended that the commission suspend operation of the Tsuruga power plant for six months, in accordance with the Reactor Regulation Law, because of safety regulations violations. ANRE also instructed JAPC to take measures to rectify the situation including: 1. a thorough inspection of the feedwater heaters; 2. the installation of a new liquid waste filtering room; 3. a unification of the control functions in the waste treatment facilities; 4. the removal of contaminated solids; 5. the sealing of the general waterway and openings leading to it; 6. better

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education and training of the employees, including supervisors, of the Tsuruga plant. JAPC was also instructed to settle fairly the question of compensation to those affected by the incident.

As a result of the Tsuruga incident, ANRE laid out a series of measures aimed at improving the standards of nuclear plant operations in Japan. These include safety improvements, better inspection procedures and the formulation and clarification of additional technical and safety standards. Other Japanese power companies were instructed to inspect their radwaste treatment facilities. They also submitted to ANRE their procedures for reporting to ensure that they met the requirements of applicable regulations and laws.

Based on ANRE's instructions, JAPC prepared a plan, subsequently approved by ANRE, for modifying the Tsuruga radwaste facilities. The modification work was completed and passed ANRE's inspection in December 1981. In addition, JAPC's improved safety management system was reviewed and approved by ANRE. ANRE submitted the result of its inspection on the modification work as well as improved safety management system to the Nuclear Safety Commission and the commission accepted it without comment on December 17, 1981.

JAPC's compensation to the local residents affected by the Tsuruga incidents has been settled. On November 11, 1981, the compensation to the Fukui Fisherman's Association was approximately $4.5 million. This compensation covers the lost sales of fishery products put on the market by the association. On December 17, 1981, the compensation to tourism-related businesses in the Tsuruga area was settled at approximately $855,000.

In general, the Tsuruga incidents gave impetus to the associations opposing construction of nuclear power plants. Although opposition has subsided, both government and utility companies will be required to expend greater efforts to obtain local consensus prior to the siting of reactors.

Another result of the incident has been a decrease in the public confidence in the safety of nuclear power. A recent government poll shows that public confidence in nuclear safety measures dropped considerably, from 54 percent before the Tsuruga accident, to 27 percent. While the Tsuruga incidents had a great deal of impact on the public at the time, the Japanese program of nuclear power development will not be greatly affected in the long run.

The recent reduction of Japan's official target for nuclear generating capacity installed in 1990 is not attributable to the Tsuruga incident. Rather, it is due to reduced forecasts of industrial demands for electricity. The incident did cause delays of a few months in the schedules for licensing and public hearings on other nuclear units.

STATUS OF US WASTE DISPOSAL EFFORTS

The United States legislative process has, so far, been unable to overcome bureaucratic, environmental and anti-nuclear forces in developing a comprehensive waste management plan. The Reagan Administration remains committed to reprocessing as a central feature of such a plan, but representatives from the commercial sector have repeatedly rejected the suggestion that they finance a reprocessing plan. DOE has pushed back the time period when an AFR (away-from-reactor site storage facility) would be needed because of utility expansion of on-site storage areas. Even with a commitment to go ahead, the siting of such storage areas would be a problem.

In the US, the issue of nuclear waste storage and disposal is being pursued on four major levels.

1. Several versions of nuclear waste legislation have been drafted in the relevant House and Senate committees. However, compromises must be made before the legislation can be passed by Congress.
2. A waste conference proceeding before the Nuclear Regulatory Commission is addressing the question of whether off-site storage or disposal of nuclear waste will be in place by the year 2008.
3. As the result of a 1980 Congressional directive that the issue be handled at the state level, organized regional groups are dealing with questions of low-level waste.
4. A draft report of a three-and-one-half-year study of high-level waste management by Congress' Office of Technology Assessment emphasizes a firm commitment to developing waste disposal capability and presents guidelines for a thorough waste management program.

Details of the actions within these four areas are discussed in the following paragraphs.

In the Senate, the Energy Committee and the Environment and Public Works Committee are reviewing each other's draft bills and are trying to develop a compromise version of nuclear waste legislation. The two drafts agree with respect to: establishment of a federal AFR storage facility; development of an unlicensed Test and Evaluation Facility (TEF); construction of at least

MARKET ANALYSIS

one geologic repository for permanent disposal of high-level waste; and development of monitored retrievable storage facilities. The main issues under dispute include: burial versus storage of nuclear waste; financing of the facilities; and timing and siting of the TEF.

Besides inter-committee differences, two other aspects of the legislation are under attack. The problem of reconciling civilian and defense waste programs must be addressed; should military waste disposal come under the purview of the NRC? Also, a strong group of Senators are opposed to the AFR provisions in both versions of the bill. Corresponding legislation in the House of Representatives has two versions which also must be consolidated into a compromise bill. The interim storage issue is one area over which disagreement continues.

The biggest problem ahead for nuclear waste legislation is reaching agreement between a House version and a Senate version. It is likely that each house of Congress will pass a bill covering the issue. However, the two versions will probably be very different and must be reconciled in a conference committee made up of representatives from both the House and Senate. A bill is not signed into law until the same version is passed in both houses of Congress. Drafts of House legislation reflect many of the environmental concerns regarding nuclear waste; the Senate versions are more compatible with the industry outlook. In the past, it has been difficult to get legislation through conference committees in an election year. This session the nuclear waste issue must contend with important budget and appropriations bills. Another factor is the likely proposal of legislation to dismantle the DOE. The two issues, waste disposal and dismantling of DOE, will be difficult to separate. There is general agreement in Congress on the need for developing a permanent burial facility and the need to have state-level participation in the siting, but to develop and agree upon specific measures will require effort the Congress is not likely to apply this year.

It does not seem that the Reagan Administration will make known its views on the different versions of legislation before the major points are resolved. However, the Administration has, through the Department of Energy, reiterated its emphasis on the swift development of nuclear waste storage and disposal facilities. DOE testimony given before the NRC waste confidence hearing expressed certainty of the presence of a licensed nuclear waste repository in 25 years. The hearing is the result of a 1979 request by a federal court for the NRC to give a vote of confidence or no confidence to the question of whether off-site storage or disposal of spent fuel would be available by 2008. Although the Reagan Administration emphasizes reprocessing rather than spent fuel, DOE officials argue that the answer to the question of *safe* disposal has not changed. It does appear, however, that the Reagan Administration is looking more at spent fuel, not only because of the current hearings, but also because support for commercial reprocessing has not been forthcoming.

Since 1980, when Congress passed an act for the establishment of regional compacts between member states to handle low-level wastes, not much action has taken place. The groups are taking quite a long time to organize themselves and are tied up with eligibility dates and exclusions within the compacts. They have not yet begun to focus on the management of low-level waste.

Concerning high-level waste management, a draft report from the Office of Technology Assessment asserts that a commitment to the development of waste *disposal* technology must be made now to ensure that the US can choose between storage and disposal in the future. The report lays out the guidelines for a waste management program which includes: commitment to a date for accepting waste from utilities at several mined geologic repositories and a program to follow through on the commitment; assurance of government financial and managerial support for such a program; establishment of oversight and regulatory coordinating of the program; and provisions for handling state and local input.

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THE ARIZONA STRIP

Introduction

Competition for land and the right to explore for uranium has never been more intense along the Arizona Strip. Recent mining and exploration activities in the area by Energy Fuels Exploration Company of Denver, Colorado has attracted the attention of major companies and a number of individuals interested in the discovery of new uranium deposits. Since September 1981, 20 to 25 thousand lode mining claims have been staked in the northern portions of Mohave and Coconino Counties, Arizona. The area claimed to date totals approximately 400 to 600 thousand acres. Figure 1 is a location map for the Arizona Strip and immediately south of the Colorado River showing the approximate areas of heavy claims staking.

The exploration target throughout the district is uranium mineralization in breccia pipes. Early prospecting in the general area revealed a number of breccia pipes exposed by erosion along the flanks of the Colorado River drainage system. Based on this relationship, geologists concluded that the occurrence of 100 to 150 breccia pipes was possible throughout the drainage system. Recent exploration and geologic interpretation indicates that pipe structures exist away from the main drainage system. Prospectors are now anticipating that discovery of several hundred pipes is a good probability. If so, the opportunity to discover a new uranium deposit is greatly increased.

A breccia pipe consists of a circular, chimney-like mass of highly fragmented rock resulting from the subsidence of large rock segments into a void created by solution activity in a lower formation. Continued subsidence causes fragmentation or "brecciation" of the large rock segments as the solution void fills with collapsed debris. Concentric fracturing and faulting are common to the outer edge of the pipe structure as a component of rock stress created by subsidence within the pipe. This feature, called the annular ring, will occur immediately adjacent to the pipe structure or in an uneven pattern radiating out from the structure by tens of meters. Thus, pipe structures vary considerably in size and pattern, but most are identifiable by the common structural features of brecciation and an annular ring.

Uranium mineralization usually occurs in association with other minerals in the highly fractured breccia zone or the area influenced by the annular ring. Occasionally, mineralization occurs as bedded deposits in undisturbed rock beyond the annular ring. Vertical and horizontal zonation of minerals is evident in the known mineralized pipes. Both primary and secondary minerals are present.

Exploration History

Uranium mineralization was known to occur in at least nine breccia pipes in the western US prior to 1965. Five of these are located in the present area of interest and along the south bank of the Colorado River. In fact, the Orphan Lode pipe, which has yielded 4.4 million pounds of uranium, is located south of the river. (The Orphan Lode mine is described in Nuexco Report 123, October 1978.) Exploration and mining activity in the area ceased with the closure of the Orphan Lode mine in 1969. However, Western Nuclear, Inc. showed renewed interest during the early 1970's, concentrating exploration on the Hack Canyon pipe where uranium mineralization is known to occur in association with copper. (The Hack Canyon mine produced copper in the early 1950's; about 5000 pounds of uranium was produced later, but all mining stopped when the operation became unprofitable in the mid-1950's.)

The discovery of additional uranium in the Hack Canyon pipe in 1973 intensified interest in the area by other companies. A modest land rush developed and about 2000 mining claims were staked. However, interest diminished rapidly due to the lack of new discoveries. Western Nuclear and Exxon Minerals were among the few companies to remain in the area with low-key exploration programs.

Energy Fuels leased all property controlled by Western Nuclear in late 1978 and immediately set out to expand the uranium reserves at the old Hack Canyon mine. Additional reserves were drilled out and by the end of 1980, Energy Fuels was mining at the rate of about 200 tons of ore per day from a deposit in an adjacent breccia zone about 1000 feet east of the old mine site.

Energy Fuels continued exploration in the immediate vicinity of the old Hack Canyon mine and eventually discovered another mineralized breccia pipe approximately one-half mile to the west. A second mine is now in production with access to the ore through a 1000 foot long decline. Total production from the two mines varies from 300 to 400 tons ore per day, all of which is trucked 327 miles to the Energy Fuels mill at Blanding, Utah.

Energy Fuels plans to develop still another ore deposit. The company is currently seeking the final permits required to mine the Pigeon Pipe located about 22 miles northeast of Hack Canyon. A vertical shaft will be sunk to gain access to the orebody after all permits

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RAW MATERIALS

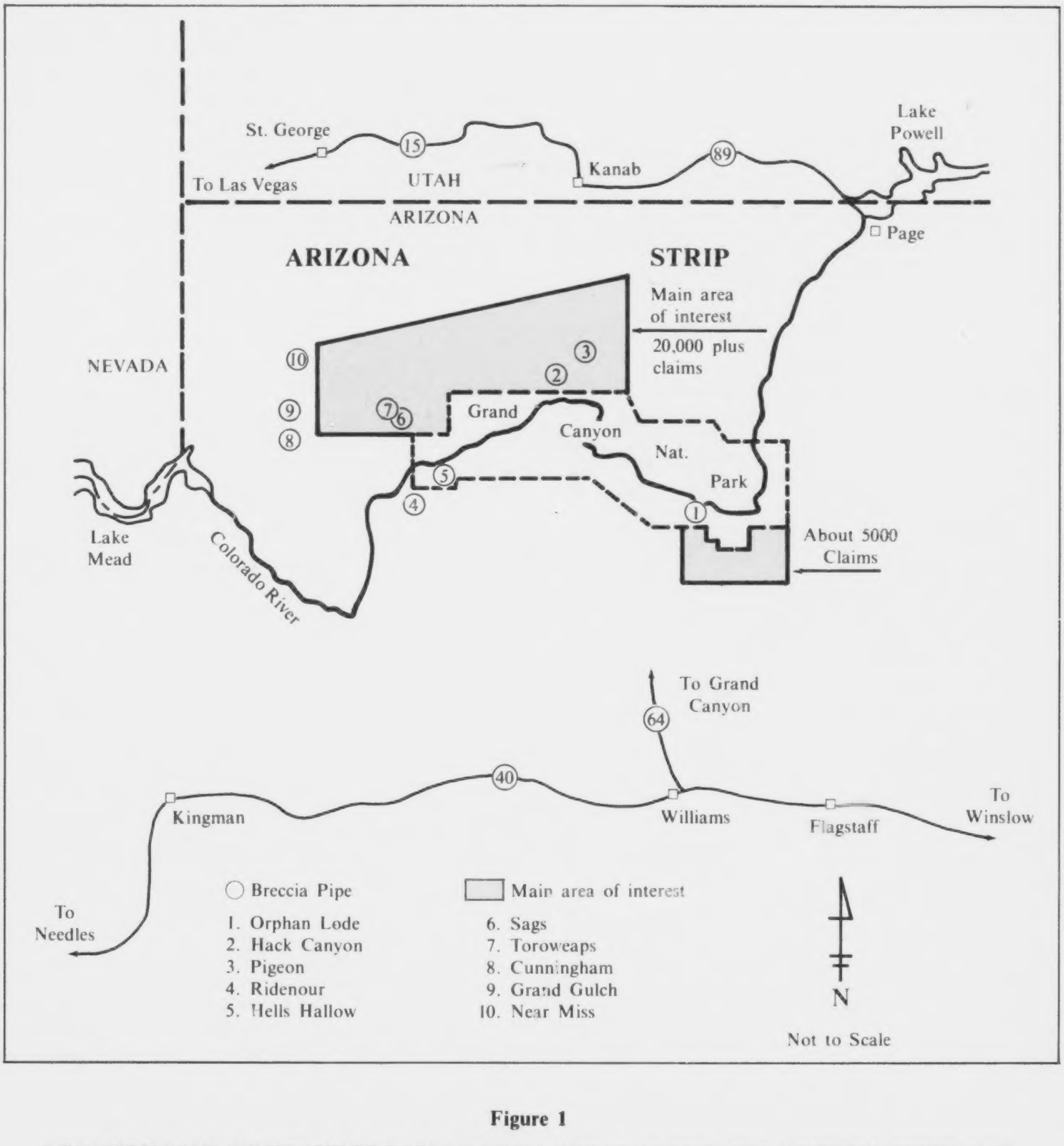
St. George
15
To Las Vegas
UTAH
Kanab
89
Lake Powell
ARIZONA
Page
ARIZONA
STRIP
Main area of interest
20,000 plus claims
NEVADA
10
9
8
3
2
7
6
Grand
Canyon
Nat.
Park
5
4
1
Lake Mead
Colorado River
About 5000 Claims
To Grand Canyon
64
40
Kingman
Williams
Flagstaff
To Winslow
To Needles
○ Breccia Pipe
1. Orphan Lode
2. Hack Canyon
3. Pigeon
4. Ridenour
5. Hells Hallow
▭ Main area of interest
6. Sags
7. Toroweaps
8. Cunningham
9. Grand Gulch
10. Near Miss
N
Not to Scale

Figure 1

LOCATION MAP OF URANIUM EXPLORATION AREAS ALONG THE ARIZONA STRIP AND SOUTH OF THE COLORADO RIVER. TEN BRECCIA PIPES IMPORTANT TO THE DISTRICT ARE SHOWN TO ILLUSTRATE WIDE DISTRIBUTION THROUGHOUT THE DISTRICT.

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have been approved. Production of ore could begin by late 1982. In addition, the company continues to explore for breccia pipes. Surface and subsurface geology are being evaluated at the present time.

The persistent activity by Energy Fuels during the past three years has drawn other companies into the district. Pathfinder Mines Corporation of San Francisco, California is currently the principle competitor to Energy Fuels for favorable land throughout the Arizona Strip. Rampart Exploration Company and a few individuals hold small land positions along the strip as well. Although the activity is far less intense south of the river, the participants vary considerably. The claims are held by Gulf Mineral Resources Company, Phillips Petroleum Company, Energy Reserves Group, Rampart Exploration Company and a group of individuals. Energy Fuels and Pathfinder Mines are not involved south of the river.

Geology

The breccia pipes found in the Grand Canyon region of Arizona were formed during a multi-stage development period whereby migrating aqueous solutions created caverns in the Redwall Limestone of Mississippian age. Eventual collapse of overlying formations (up through Permian age) into a cavernous area began, progressing upward to form a vertical pipe-like structure partially filled by the down-dropped blocks. Rapid erosion caused by increased solution activity allowed the blocks to subside further. The break-up continued, forming a core of brecciated material. The breccia zone shows varying degrees of porosity and permeability according to rock-type and the effect of prolonged exposure to aqueous solutions. Development of the annular ring structural features are directly associated with subsidence in the pipe and subsequent rock stress created by collapse and arching characteristics of the formations.

The surface expression of a breccia pipe usually, but not always, has visible evidence of subsidence in the Kaibab Limestone and Moenkopi Formation which forms the surface throughout much of the district. However, most pipes are identifiable on the surface by pale green and yellow to white rock alteration which shows at least a partial outline of the pipe structure. Evidence of brecciation and annular ring features may be revealed by detailed on-site examination. It may be noteworthy that not all surface subsidence, often called sinkhole topography, is related to breccia pipes. Numerous sinkholes appearing in succession or in clusters are commonly associated with ancient or existing stream valleys. The features mentioned above are no more than subtle guides for locating a breccia pipe. Making an ore discovery is considerably more difficult and requires the application of modern geologic techniques.

Mineralization

The probable source of uranium mineralization in the breccia pipes was the oxidizing, mineral-rich solutions ascending from the massive sandstones of the Supai Formation to saturate and alter the breccia zone and the annular ring structures. The solutions contained an abundance of minerals as evidenced by the sixty different metallic minerals identified in the Orphan Lode mine. However, the only minerals of economic interest are uranium and copper. It is apparent that formation permeability and porosity were important to the localization of the ore minerals.

There is evidence that intense alteration and remobilization of minerals occurred as a result of continuous migration of supergene (descending) and hypogene (ascending) solution activity during the Miocene and Pliocene times. Mineralization has been noted in all formations influenced by the pipe structure. However, enriched zones of large high-grade accumulations of ore are limited to a select environment within the structure. High-grade ores occur in the annular ring and the breccia zone of the Supai Formation at the Orphan Lode mine, but are primarily limited to the Hermit Shale segment of the breccia zone at the Hack Canyon Mines. The latter occurrence supports the theory of upward migration of mineral-rich solutions and enrichment of ore by the action of miocene/pliocene solution activity. Uraninite and coffinite are the main ore minerals present in the district; torbernite and metatorbernite are perhaps the most important secondary minerals present out of eight to twelve less common supergene minerals found in the Orphan Lode mine.

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STATISTICAL DATA

EXCHANGE VALUE $23.00/lb. U_3O_8
Determined as of February 28, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

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[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of February 28, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
23.70	2.2	14	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161 of January 1982.

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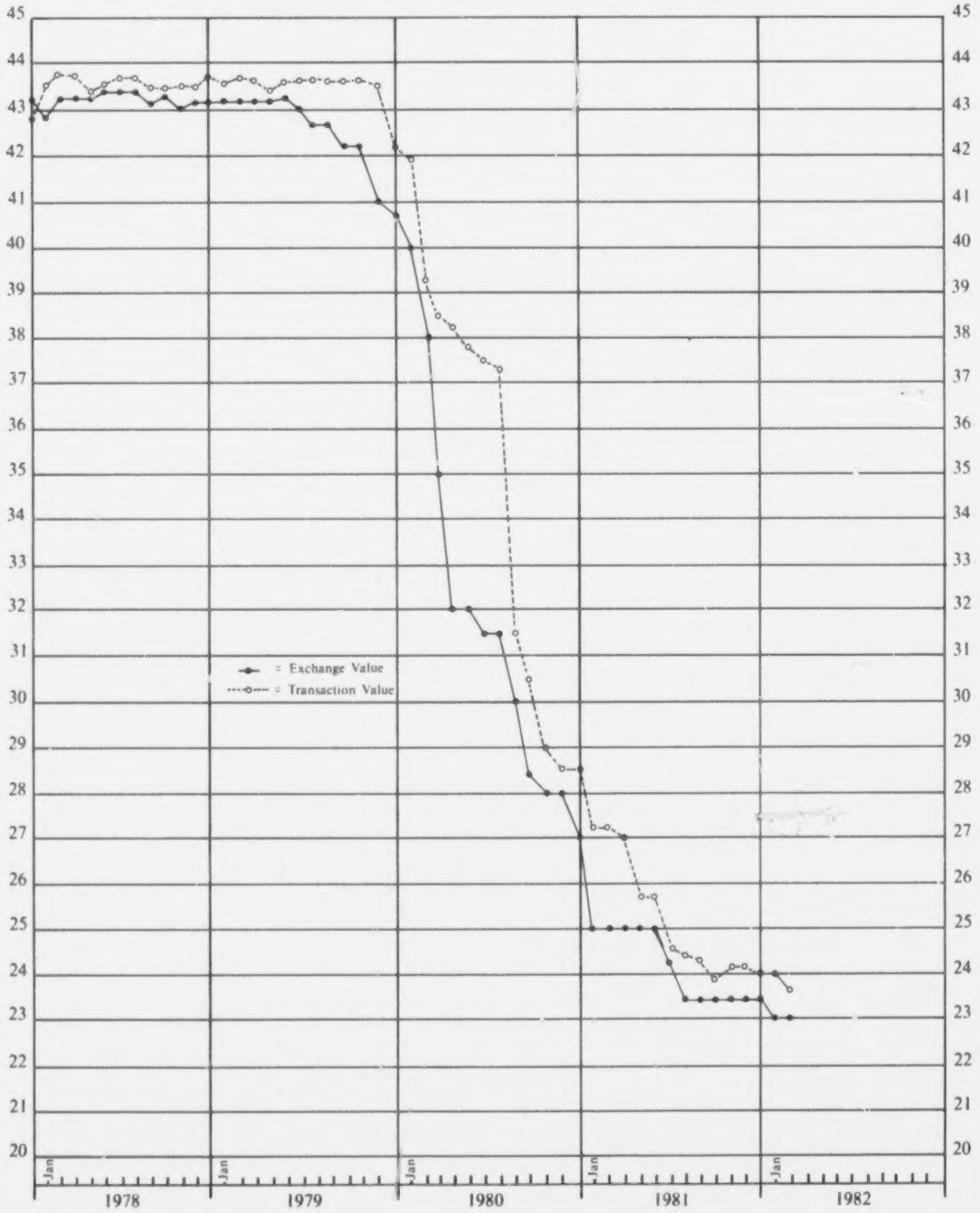
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00										

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70										

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	23.00	50.71	59.79
France (franc)	139.06	306.57	361.52
FRG (mark)	54.53	120.21	141.76
Japan (yen)	5,419	11,948	14,089
Switzerland (franc)	43.25	95.35	112.44
UK (pound)	12.52	27.61	32.56
Australia (dollar)	21.36	47.08	55.52
Canada (dollar)	28.08	61.90	73.00
Niger, Gabon (CFA)	6,949	15,319	18,065
South Africa (rand)	22.36	49.30	58.14
Sweden (kröner)	132.79	292.76	345.24

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of February 28, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of February 28, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162 of February 1982.

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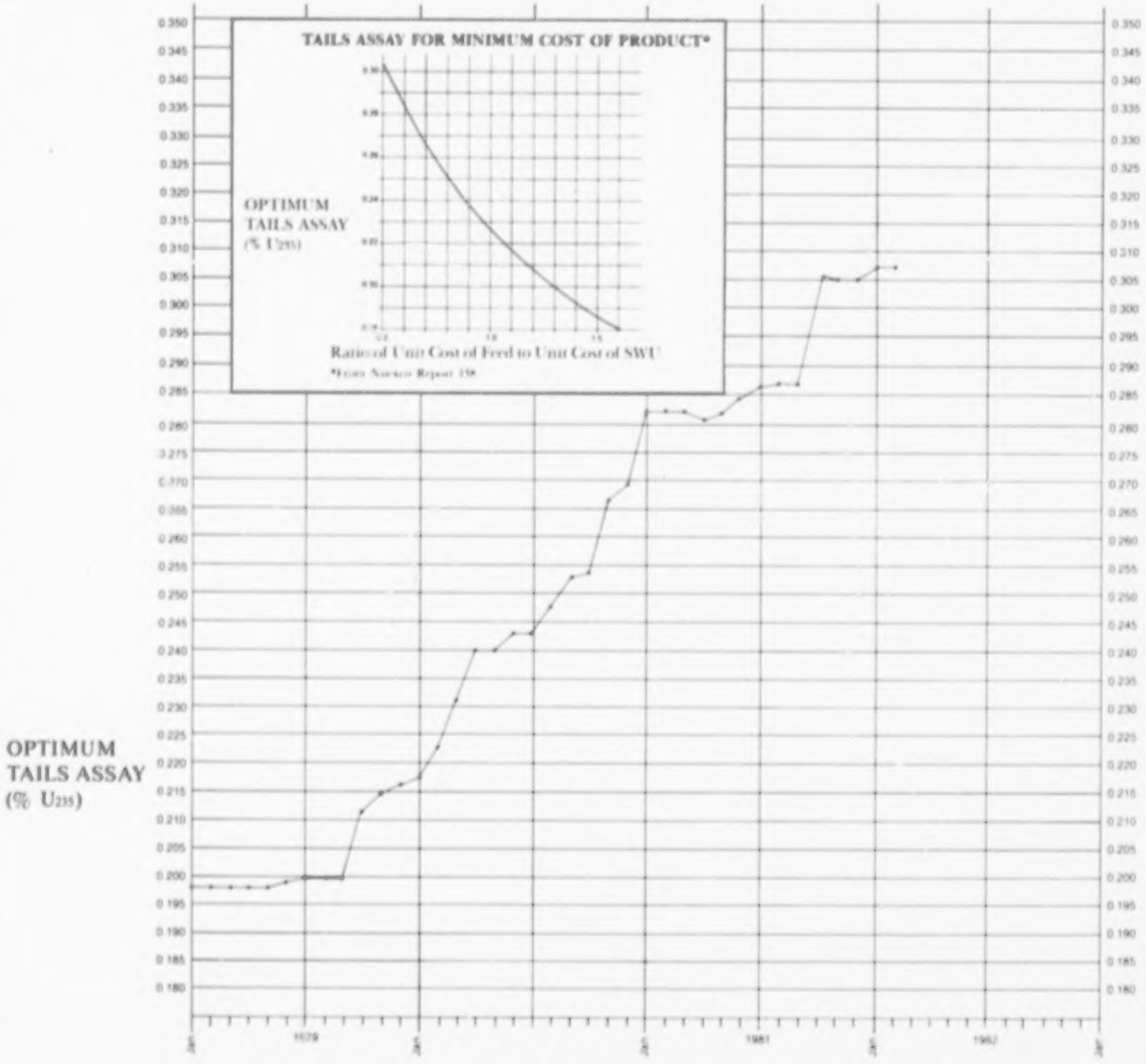
STATISTICAL DATA

OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.01
Annual Avg. 1981	355.2	235.62
Oct 1980	348.2	221.07
Nov 1980	350.4	221.50R
Dec 1980	351.7	222.41R
Jan 1981	357.8	230.58R
Feb 1981	356.6	230.41R
Mar 1981	355.2	229.66R
Apr 1981	354.6	229.38R
May 1981	353.4	237.31R
Jun 1981	360.4	237.62R
Jul 1981	356.9R	237.54R
Aug 1981	359.7R	237.54R
Sep 1981	357.2R	237.51R
Oct 1981	351.4R	238.77R
Nov 1981	350.5R	240.41R
Dec 1981	348.7P	240.76P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1,2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3,4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.8	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3	11.27	8.51	8.90
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.5	11.47	8.63	9.17
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0	11.99	8.90	9.49
Jun 1981	272.3	11.80R	9.16	9.57
Jul 1981	274.3	11.92R	9.20	9.62
Aug 1981	276.1R	11.83R	9.15	9.63
Sep 1981	276.6R	12.63R	9.22	9.77
Oct 1981	278.8R	12.82R	9.35P	9.91R
Nov 1981	278.2P	12.96P	9.44P	9.92P
Dec 1981	279.2P	—	—	—

P = Preliminary   R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1970[3]	7.34	100.3[4]	—	655,346	399,164
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3, 6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3, 6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3, 6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Oct 1980	—	186.3	203.1	720,246	204,602
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6R	724,604R	251,502R
Oct 1981	—	213.4R	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.
[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."
[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
[4] April 1970 = 100.00.
[5] Bulletin of Statistics, Department of Statistics, Pretoria.
[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	—	—	272.4	193.69R	—	—	—	—
Mar 1981	299.6	290.3	265.1	188.14	11.13	11.50	8.84	7.47
Apr 1981	303.5	293.4	266.8	—	11.30	11.63	8.94	7.51
May 1981	304.7	294.1	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1	294.5R	271.3	191.06	11.31	11.88	9.07	7.60R
Jul 1981	306.2	296.0R	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.2	296.2R	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	307.2R	295.5	279.3	195.61	12.11	12.68	9.38	7.79
Oct 1981	308.8P	296.0P	279.9	—	12.09R	12.43R	9.37R	7.84
Nov 1981	309.1P	295.5P	280.7	—	12.14R	12.47P	9.42R	7.86R
Dec 1981	310.1P	295.9P	281.5	200.01R	12.05P	12.38P	9.47P	7.92P
Jan 1982	311.7P	298.2P	282.5P	—	—	—	9.67P	7.96P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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NUEXCO REPORT 163
EXECUTIVE SUMMARY

Exchange Value Remained at $23.00

The **Exchange Value** as of February 28, 1982, is $23.00 per pound U_3O_8.

Near Term Supply-Demand Ratio Increases

As indicated in the *Market Data* section, the total of material available for sale in the near term is approximately 10.9 million pounds U_3O_8. Uranium demand in the same time period totals approximately 3.3 million pounds U_3O_8. The ratio of near-term supply to near-term demand for uranium increased from 2.5:1 in January to 3.3:1 this month.

Transaction Value Decreases Thirty Cents to $23.70; Four Uranium Sales Reported

The **Transaction Value** as of February 28, 1982, is $23.70 per pound U_3O_8. It includes fourteen transactions totaling 2.2 million pounds U_3O_8 and covers a period of three months.

Conversion Value Remains at $1.20

The secondary market for conversion services was quiet during February. The **Conversion Value** held steady at $1.20 per pound U as UF_6. No secondary market conversion transactions are reported. Several secondary market conversion transactions are under discussion at price levels consistent with the Conversion Value.

Nuclear Power Progress in 1981

Nuclear power generated 706 million megawatt-hours of electricity in 1981, a 16% increase over 1980. The biggest differences occurred in France and the US, but Sweden, Finland and West Germany had large percentage increases as well. Sixteen reactors started up outside the US in 1981, adding almost 14 GWe to the world's generating capacity. Six reactors were ordered in 1981, four in France and two in Japan. At least ten reactors outside the US suffered schedule delays of one year or more during 1981.

Tsuruga Suspension Lifted. JAPC Received CP for Tsuruga

After a six-month suspension, JAPC's Tsuruga Unit 1 resumed commercial operation in January. MITI issued a construction permit for Tsuruga Unit 2. The permit had been delayed by last year's radwaste spillage incident at Unit 1.

Status of US Waste Disposal Efforts

US waste disposal efforts remain stalled in Congress.

The Arizona Strip

The *Raw Materials* section examines the geology of the Arizona Strip.

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APRIL 1982 NUMBER 164

Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

April 1982 No. 164

R. WESLEY MILLER, *EDITOR*

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FOREWORD

We are pleased to announce that Scott Hickman has moved to Nuexco's New York office, where he will be associated with Jim Vaughan and Katie Bowen in brokerage activities.

In the past, it has been Nuexco's policy to release the Exchange Value *no earlier than* 8:00 AM California time on the first business day of each month. As a consequence of the opening of our New York office, Nuexco will henceforth release the Exchange Value beginning at 9:00 AM *New York* time.

NUEXCO

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of March 31, 1982 is $22.50 per pound U_3O_8, down $0.50 from last month.

This price decline is attributable to two factors. First, aggressive new sellers have appeared in the market, offering large quantities of material for near-term delivery. The ratio of near-term supply to near-term demand increased from 3.3:1 last month to 5.2:1 this month. Secondly, in the face of this increased supply, sellers demonstrated their willingness to cut prices to conclude transactions.

In an effort to describe the current market situation in a more meaningful fashion, the listings of uranium and conversion supply and demand appearing in the *Market Data* section have been revised to differentiate between active and inactive situations. The principal determinant in each case is price. Active sellers are those prepared to sell at or about current market levels. Inactive sellers are those with material available for sale, but who are unwilling to sell at current price levels. Similar distinctions are applicable to buyers, lenders and borrowers. This approach is designed to provide a measure of the active market, while also providing a measure of total market size.

The **Transaction Value** as of March 31, 1982 is $23.40 per pound U_3O_8 down $0.30 from February. March's Transaction Value includes 12 transactions totaling 2.8 million pounds U_3O_8 and covers a period of three months.

There are six uranium sales transactions and one conversion transaction reported this month:

1. A US entity sold 50 thousand to 100 thousand pounds U_3O_8 to a European buyer for delivery in the first half of 1982.
2. A US producer sold less than 50 thousand pounds U_3O_8 to a US entity for immediate delivery.
3. A US producer sold 101 thousand to 300 thousand pounds U_3O_8 to a US producer for immediate delivery. (This is the rumored transaction noted last month.)
4. A US producer sold 50 thousand to 100 thousand pounds U_3O_8 to a US utility for immediate delivery.
5. A US producer sold 301 thousand to 600 thousand pounds U_3O_8 to a US producer for delivery in the second quarter.
6. A US utility sold 101 thousand to 300 thousand pounds U_3O_8 to a European buyer.

The **Conversion Value** as of March 31, 1982 is $1.20 per pound U as UF_6, unchanged from last month. One transaction is reported this month and a second is under negotiation. It appears that substantial additional conversion will soon become available in the secondary market as a consequence of the entry of new UF_6 sellers in the uranium market.

In a secondary conversion market transaction, a US utility sold between 301 thousand and 600 thousand pounds U as UF_6 to a European buyer for delivery during early 1983.

The **Loan Use Charge Rate** remained at six percent.

AFRICA

Niger's two uranium facilities, Arlit and Akouta, produce a total of about 10.5 million pounds U_3O_8 annually. France receives about 45 percent of this total through Cogema's equity ownerships in the two projects and via the uranium allocated to other French shareholders. Somair's (Arlit) ownership is divided as follows:

Onarem (Niger)	33.00%
Cogema (French)	26.96%
CFM (French)	19.38%
Minatome (French)	7.58%
Urangesellschaft (German)	6.54%
AGIP (Italian)	6.54%
Total:	100.00%

Cominak's (Akouta) ownership is divided:

Onarem (Niger)	31.00%
Cogema (French)	34.00%
Ourd (Japanese)	25.00%
Enusa (Spanish)	10.00%
Total:	100.00%

The Japanese, German, Italian and Spanish shareholders have historically taken their pro-rata shares of production.

Onarem, Niger's state uranium entity, controls about one third of the country's production. In earlier years, all or most of that production was taken up by French interests. More recently, both as a consequence of declining prices and a desire to demonstrate a degree of independence from France, Onarem has increasingly pursued its own marketing efforts. Sales by Onarem to a number of different buyers have been made.

Most notably, more than five million pounds U_3O_8 have reportedly been sold to Libya over the past four years — some three million pounds in the first half of 1981 alone. Speculation about the reasons for the

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Libyan purchases has been widespread. French journalistic sources note three possibilities:

1. Purchases on behalf of a third party (Pakistan or Iraq) for the manufacture of an Islamic bomb.
2. Purchases on behalf of the USSR in payment for arms deliveries.
3. Purchases for a strategic stockpile in anticipation of the day when Libya will have its own nuclear industry.

Such sales to Libya must be considered as an unusual short-term opportunity for Onarem to obtain premium prices for its uranium. However, even in the longer term, political realities suggest that Niger's uranium may not be exposed to the full impact of world market forces, assuming that annual negotiations produce acceptable prices and the French or other Niger shareholders have the need and willingness to purchase unsold Onarem production.

In an unusual break with normal practice, a uranium producer in the **Republic of South Africa** publicly identified its foreign customer. Specifically, the South African press reported that Japanese customers had committed to take a significant proportion of Beisa Mines' uranium production. Earlier reports had indicated only that development of the mine was financed by a consumer loan and a long-term uranium contract arranged in the late 1970s. The deliveries, covering about 80 percent of planned production, are scheduled to begin in 1983. Earlier production will be stockpiled.

South Africa has long-standing policies (and legislation) precluding the publication of commercial uranium information. Thus, the decision to identify a uranium buyer in this instance must be viewed as serving a specific end. Absent other information, it can only be assumed that the intent is to reassure existing and potential customers that they may continue to have confidence in South Africa as a reliable long-term uranium supplier.

Last year the assets and mining rights of Beisa, a company administered by General Mining Union Corporation (Gencor), were acquired by St. Helena Gold Mines (also a Gencor company). The transaction involved the use of St. Helena's tax shield, which enabled the Beisa Mines' capital expenditures to be deducted from St. Helena's taxable income. Production began in December of last year and the mine is scheduled to reach full capacity by mid-1982. Based on published grade, capacity and recovery factors, Beisa's production could exceed 1,700,000 pounds U_3O_8 annually.

Of particular significance is the fact that Beisa is the first South African development where uranium was visualized as the primary product and gold the by-product. The economic viability of the operation will depend, of course, on two factors -- the price terms of the long-term uranium contract (which are not known) and the price of gold (which has fallen to less than $350 per ounce from its 1980 high of $850).

As if to emphasize the above comments, Palabora Mining Company's (PMC) just-issued 1981 annual report noted that PMC concluded a contract for delivery of a substantial quantity of uranium to a new customer during the first quarter of 1982. PMC produced 525,000 pounds U_3O_8 during 1981, an increase of 36 percent over its 1980 production of 383,000 pounds. PMC's uranium production is a by-product of its copper operations, and the increased output, which is expected to continue, is attributable to improved metallurgical recovery.

AUSTRALIA

Sales initiatives from representatives of two large Australian uranium projects have begun or will begin shortly. Plans are being made to offer additional tonnage from Energy Resources of Australia (ERA)'s Ranger facility. Vying for the limited international demand will be production from the Jabiluka project, which recently passed the last approval hurdle required for market entry.

The conservative design of the Ranger plant allows ERA, only six months after start-up, to produce at a rate of 20 percent above its nominal capacity of 3,300 tonnes U_3O_8 per year. After some minor modifications to the plant, ERA will soon be able to exceed the nominal production rate by 50 percent.

The development of Australia's largest uranium deposits, Jabiluka, took two major steps forward during the past month. An agreement between the Northern Land Council (NLC) and Pancontinental Mining Ltd., the project operator, was initialled on February 27, 1982 after 13 months of negotiations. Pancontinental owns 65 percent of Jabiluka; the remainder is owned by Getty Oil Co. This agreement with the NLC on behalf of the Aboriginal owners was the last requirement the mining company had to meet in order to satisfy government environmental conditions. The document now goes before the Aboriginal people for ratification. Details of the agreement have not been disclosed but present

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indications are that the partners will be required to make a substantial advance payment in addition to a royalty rate of not less than 2.5 percent on sales. The advance payment is made upon receipt of the last lease before production, thus, not before the project is committed to proceed. Royalties will flow to the Aboriginal Trust Fund.

The second significant step forward was the March 17 announcement of government approval of the project. Coming just three weeks after the NLC agreement, the swiftness of the approval was surprising and can be largely attributed to lobbying by the NLC. The NLC has recently taken an increasingly favorable attitude towards the project's development and had requested the government to expedite the final approval of the project, which is essential for market entry.

Within the guidelines set by the Australian government, Pancontinental and Getty are now free to negotiate contracts for the sale of Jabiluka uranium. Market testing is underway by representatives of the joint venture. Government guidelines require the seller to submit for approval the specific customers, tonnage and schedule prior to the commencement of negotiations. The ministry then specifies the terms of sale. The sales contracts must contain a pricing mechanism which provides for a floor price and a cost-related escalation formula.

Jabiluka is the sixth Australian project to have received government approval. Its proposed production capacity is to be 4,500 tonnes U_3O_8 per year. A substantial portion will have to be committed under long-term sales contracts to justify the construction of this A$600-700 million project, a daunting challenge in the present market.

The joint venture partners in the Olympic Dam copper-gold uranium deposit, Western Mining (51 percent) and British Petroleum (49 percent), signed an indenture agreement with the South Australian government early this month. This type of agreement represents an obligation on the part of the partners to continue property development in exchange for a mining lease for the minerals in the ground and a government contribution to the infrastructure costs. Specifically, the agreement commits the partners to an ongoing development program of A$50 million before 1984, and provides for a two-tier royalty system. The basic royalty is 2.5 percent on ex-mine value of production, rising to 3.5 percent after five years. In addition, the partners are required to pay a "surplus-related royalty" of up to 15 percent on the "surplus return" on shareholders' funds after tax and after a threshold return.

The indenture is based on copper production of up to 150,000 tonnes per year. No details on the proposed uranium production are given, but at maximum copper production, the amount could be between 4,000 and 5,000 tonnes U_3O_8 per year.

The state will be required to make a variety of infrastructure services available to the project in return for royalties. Although an upper limit on the state's outlay has not been set, it is not likely to exceed A$50 million.

The project partners have already spent $50 million on Olympic Dam and do not plan to proceed with further expenditures without the security of an indenture agreement approved by Parliament. Neither the state's Labor Party nor the lone Australian Democrat who holds the balance of power in the Upper House have signaled a change in their opposition to such an agreement. Thus, the scene is set for a major political battle. Protracted opposition could force a state election in which the Olympic Dam project would be the central issue.

CANADA

Exploration for uranium in Canada peaked in 1979 and has been declining over the past two years. Present indications are that exploration, as measured by total dollars expended, may fall rapidly in 1982. Government statistics for 1980, the latest reported year, show a modest decline from $129.5 million in 1979 to $128.0 million in 1980. However, in 1980, more than one-third of the total was accounted for by oil companies or their affiliates, many of which were less active or altogether absent in 1981. Federal and provincial government corporations accounted for 13 percent of the total.

The ten most active organizations in 1980, accounting for 56 percent of the $128 million total, were: Amok Ltd.; Asamera Inc.; Canadian Occidental Petroleum Ltd.; E&B Exploration Ltd.; Eldorado Nuclear Limited; Gulf Minerals Canada Limited; Pan Ocean Oil Ltd.; Saskatchewan Mining & Development Corporation; Uranerz Exploration and Mining Limited; and Urangesellschaft Canada Limited.

Of these, E&B Exploration totally abandoned exploration for uranium in 1981 and Pan Ocean remained active through joint ventures, abandoning its formerly aggressive role in the Northwest Territories.

A continuing trend away from uranium exploration is

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clear on examining publicly announced programs for 1982:

1. SMDC is diversifying its efforts into base and precious metals. Of 55 projects, 17 will be directed to uranium in Saskatchewan, 13 will be directed to base and precious metals in Saskatchewan and 25 will be directed toward base and precious metals outside the province. Uranium will not be sought outside of Saskatchewan.
2. Eldorado will remain active in uranium exploration, but is directing increasing effort to base and precious metals.
3. Brinco will defer exploration for uranium in Saskatchewan and Labrador, except for a continuing joint venture with Edison Development Canada in Eastern Labrador.
4. Canadian Occidental is concentrating heavily on coal, oil and gas; uranium is notably absent from its announced exploration plans.
5. Shell Canada has discontinued all mineral exploration activity.
6. Esso Minerals Canada is clearly directing its efforts to other metals with notable slowdown in developments at Midwest Lake and in exploration programs with others.
7. Denison is concentrating expenditures in exploration for oil and gas, particularly in foreign off-shore locations. Exploration for minerals, including uranium, will continue, but with significantly reduced efforts.

In a separate development, a press release accompanying the release of SMDC's annual report states that SMDC has made long-term sales commitments for about half of their six million pound share of Key Lake's annual production capacity. Commitments are reportedly in place with utilities in Japan, South Korea, West Germany, France and Finland, and they are negotiating contracts with utilities in Western Europe, the United States and Canada. It is Nuexco's understanding that many of the commitments have not yet been submitted to the Canadian Government for approval, although some have been. Based upon the press release and the marketing success of all the Key Lake partners, it can be inferred that Key Lake is now base loaded until approximately 1990.

EUROPE

Iberduero, the largest utility in **Spain**, has reached agreement with the autonomous Basque local government and the Spanish central government on the control and operation of the two-unit Lemoniz nuclear power plant. The Basque government will assume responsibility for the plant's operations and safety, while the utility will retain ownership and financial control.

All technical work on the two 930 MWe units was stopped in February 1981 when the Chief Engineer was assassinated by ETA (the Basque separatist organization). ETA has caused almost 25 million dollars worth of damage during its campaign of violence against Iberduero's installations in the Basque country.

Since Iberduero could do nothing about security in the Basque country, it stopped work on the plants. The Basque government stated that it was only prepared to accept responsibility if it obtained full control to operate the plants and monitor their safety. The government in Madrid would not allow a referendum and was unwilling to accept the Basque government's demands. Furthermore, since 80 percent of Spain's electricity production and distribution is in the private sector, it wanted to avoid any action which might look like nationalization.

The agreed solution calls for Iberduero to retain financial control of Lemoniz with the plants remaining part of the company's fixed assets. The utility company will pay a fee to the Basque government to run the plant. The latter will form an operating company which will probably consist of existing Iberduero staff. The responsibility for safety will be subordinated to control by the National Nuclear Energy Regulatory Commission. The first plant is not expected to begin trials until early next year.

Finland's two utilities, Teollisuuden Voima Oy (TVO) and Imatran Voima Oy (IVO), have undertaken a joint study to consider the joint development of a new 1000 MWe nuclear unit project. The plant, if approved, could be in operation by the early 1990s. No decision on the type of reactor has yet been reached. However, IVO has received offers from the USSR for a 1000 MWe WWER type PWR and for a similar sized unit from a French supplier.

IVO has two 440 MWe PWR (USSR type) in operation at Loviisa. TVO has two 600 MWe BWR (ASEA-ATOM type) in operation at Olkiluoto.

In **Hungary**, the first block of the nuclear plants at Paks are scheduled to go into operation in the second half of 1982. Type is the WWER-440 MWe PWR. Three more identical units are under construction at the same site. Plans call for eventually building a number of 1000 MWe nuclear units at the same site.

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MARKET ACTIVITIES

On March 1 in Warsaw, **Poland**, a report was published to the effect that the green light was given for Poland's first nuclear power plant. It is planned to be located in the area of Zarnowiec near Danzig. The type is to be the USSR-WWER, size 440 MWe. Four units are planned and the first is scheduled to begin operations by 1988 or 1989.

However, the president of the Polish Parliament Subcommission for Energy has taken the opposite view, saying the units are not needed. Also, the newspapers have said the plants are too expensive and dangerous and, thus, they should not be built. The pro-nuclear side has stated that when in operation the nuclear units will save Poland about 3 million tons of coal (referred to as Poland's black gold) per year, which can be exported. Given the widespread disagreement on the merits of the project, it is likely that a lengthy debate will precede the start of construction, if the units are built at all.

In the **Soviet Union**, according to Pravda, construction has been started for the nuclear plant Nabereschnye Tschelny, which is located in the Tatarischen ASSR area. The unit will be on the 1000 MWe WWER type PWR. Plans call for four such units to be built at this station eventually.

Just east of the border to Baschkirien, in the middle of the Ural area, another six nuclear units of the same size and type are planned. There was no mention that actual construction has been started on any of these.

FAR EAST

Japan's current nuclear picture is as follows:
15,676 MWe (23 units) in commercial operation
10,110 MWe (11 units) under construction
6,385 MWe (7 units) planned

Two of the units under construction, Fukushima II-1 (1100 MWe BWR) and Ikata-2 (566 MWe PWR), are scheduled to enter commercial operation before mid-year 1982. All the other units under construction are scheduled for startup by March 1986.

The planned units are those authorized by the Electric Power Resources Development Coordination Council (EPRDCC). Scheduled operation dates range from March 1986 to October 1989. An additional 5 units representing more than 4,000 MWe will probably be authorized by EPRDCC during its 1983 fiscal year (April 1, 1982 — March 30, 1983). Presumably these 5 units will all be operating by the early 1990s, at which time Japanese uranium consumption would be about 14,000,000 U_3O_8 annually.

Japanese utilities have completed negotiations with two of their major suppliers with respect to 1983 delivery prices. The agreed upon prices, $35.40 and $35.45 per pound U_3O_8, are lower than the $37.00-$38.50 range negotiated in 1981 for 1982 deliveries. Furthermore, they are substantially below the $45.00 prices negotiated in 1980 for 1981 deliveries. This price erosion is not surprising in light of the improved negotiating posture of buyers in a market characterized by oversupply and the consequent sharp drop in spot prices.

SOUTH AMERICA

Brazil's first power reactor, Angra-1, went critical during March. The reactor is roughly five years behind original schedule, as is the entire Brazilian national program.

Graduated low-power testing up to thirty percent power is the next step toward commercial operations. The granting of further licenses will depend on the results of Westinghouse efforts to resolve problems with a steam generator.

UNITED STATES

Gulf Oil has restated it plans to keep its Mt. Taylor uranium mine in production and explains its recent purchase of 1 million pounds U_3O_8 as an "inventory adjustment." Gulf has been having trouble getting its Canadian production into the United States where the producer has supply commitments to fulfill.

Washington Public Power Supply System (WPPSS) continues to have financial problems. The controlled termination of units 4 and 5 has not settled the utility's cash problem and plans to defer or "mothball" two of the remaining three units are being developed. Any decision will be made jointly with the Bonneville Power Administration, a federal entity, which is studying future power needs in the Pacific northwest. To add to the utility's financial problems, the federal judge in the WPPSS-Western Nuclear litigation has ruled that the supply contract between the two companies signed in 1975 is enforceable and that WPPSS must pay for past refused deliveries as well as damages to Western Nuclear for any future refused deliveries.

New Mexico and Arizona Land Company (NMAL) is essentially out of the uranium producing business now that NMAL has terminated its forty percent interest in

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MARKET ACTIVITIES

the Ruby uranium mine located in New Mexico. That forty percent interest now reverts to Western Nuclear, which has indicated it has no plans to close the mine.

Conoco has requested permission to begin minor reclamation work at the Conquista mine and mill, once the operation shuts down in mid-1982. Conoco will continue in the uranium business with output coming from a joint venture operation at Benavides, Texas and its own in-situ project at Trevino, Texas which began production in 1981.

A Nuclear Regulatory Commission staff report presented to Congress in March listed 19 nuclear power plants with construction permits which, in the staff's opinion, would be cancelled or indefinitely deferred. That the opinion was admittedly based on "conjecture, newspaper articles, conversations with financial houses, and hearsay rather than any official announcement from the applicant" has not kept the report from becoming controversial.

Ten of the nineteen plants are among the fourteen reactors Nuexco expects to be cancelled as discussed in Nuexco Report 161 of January 1982. Nuexco's forecast of Apparent Future Consumption detailed in Table 4 of this Report includes nine of the listed reactors, but their forecast dates of commercial operation are less optimistic than the owner's plans.

The nineteen reactors and their percentages of completion as given in the Nuclear News World List of Nuclear Power Plants as of December 31, 1981 are shown below.

Although uranium business in the US has been transacted for several years with the ever present possibility of a renewed embargo on foreign uranium, few in the industry believed that one would be reinstated. However, with the limitation of foreign uranium due to be lifted next year and today's depressed market, there have been increased efforts to reestablish an import quota. A hearing on the viability of the US uranium mining and milling industry was held in September and now some definitive action has taken place. By means of a last-minute parliamentary maneuver, the pro-embargo forces have managed to attach a piece of embargo legislation to an NRC budget authorization bill.

NRC budget legislation was passed by both the House and Senate and is due to go to conference committee. An amendment to the bill included a mill tailings act. The Senate version of the bill has, attached to it, a rider which would limit the amount of foreign uranium a US utility could use. As written, the rider calls for the establishment of criteria for issuing licenses for importing source material and special nuclear material such that 80 percent of the future fuel needs of a licensed facility would be supplied from material mined and milled in the US.

Differences in the two bills, especially the rider attached to the Senate version, must be reconciled in a conference committee made up of members from both the House and Senate. A final version would go before President Reagan for signature and could become law.

Reactor	**Utility**	**% Complete 12/31/81**
Cherokee 1,2,3	Duke Power	18,0,0
Clinton 2	Illinois Power	0
Grand Gulf 2	Mississippi Power & Light	22
Harris 2	Carolina Power & Light	4
Hartsville B1, B2	Tennessee Valley Authority	17,7
Limerick 2	Philadelphia Electric	30
Marble Hill 2	Public Service of Indiana	14
Nine Mile Pt 2	Niagara Mohawk	37
North Anna 3	Virginia Electric Power	9
Phipps Bend 1,2	Tennessee Valley Authority	25,5
River Bend 2	Gulf States Utilities	0
Seabrook 2	Public Service of New Hampshire	9
South Texas Unit 2	South Texas Project	23
Vogtle 2	Georgia Power	9
Yellow Creek 2	Tennessee Valley Authority	3

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The conference committee will include senators from New Mexico, Colorado and Wyoming, states in which the future of the US uranium industry is a critical issue. Thus, there will be pressure from the Senate side to retain the embargo provisions in the final version.

The rider contains a clause which would exclude existing contracts from the restriction, provided that the contracts were consummated before the bill was signed into law by President Reagan. Those US producers who have contracted to purchase foreign uranium as an alternative to producing uranium would probably be protected as long as their contracts to supply the uranium were in effect prior to the signing of the bill. Any domestic producers who contracted to purchase foreign uranium ahead of a related delivery contract would probably not be eligible to deliver the uranium under the Senate version.

At press time, word of the passage of the Senate version had just begun spreading. It is difficult to assess the likelihood that the embargo rider will survive the conference committee. The senators from the uranium industry states are expected to fight hard for its passage in the conference committee. For example, State Department sources are concerned that Australia and Canada might impose retaliatory trade restrictions. Whatever the outcome, Senator Domenici has achieved his objective, to revive interest in the issue.

The rider, as it applies to the import restriction, is reproduced below:

Subsection E, Section 62 of the Atomic Energy Act of 1954 as amended is amended by designating existing Section 62 and Subsection 62a and by adding a new Subsection 62b to read as follows:

Reporting requirements for importing source and special nuclear material.

The commission shall establish by rule criteria for the issuance of specific or general licenses for importing source material and specific or general licenses for importing special nuclear material that will provide for essential security interests of the United States by insuring sufficient domestic mining and milling capacity to supply long-term domestic source material requirements. The criteria shall include such reporting requirements as the commission deems necessary to ensure compliance with the criteria established pursuant to this Subsection.

The criteria shall also provide for such essential security interests by establishing restrictions on importing source materials and special nuclear material from foreign sources sufficient to ensure that no less than 80% of the future fuel needs of any facility licensed or required to be licensed under Section 103 or 104b of this Act other than a facility licensed for purely research purposes or a facility described in paragraph 1 or 2 of Section 202 of Public law 93-438, are supplied only by source material mined, milled in the United States. Existing contracts for foreign source material consummated prior to the date of enactment of this Subsection shall be excluded from this restriction to the extent that contracted supplies from foreign sources exceed the permitted level.

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Sale:			
Active			
1475	1,500		UF_6
1490	800		
1575		500 per year	Long Term
1584	500		
1610	200		
1637	500		
1684	500		UF_6
1739	1,600		UF_6
1807	700		
1872	340		
1877	50		
1895	1,900		UF_6
1906	230		
1907	130		UF_6
1909	2,200		UF_6
TOTAL:	11,150		
Inactive			
1581B		150 per year	Long Term
1664	100		
1738	750		UF_6
1774	50		
1804	615		
1805		500 per year	Long Term
1810	750		
1812A	800		
1814	250		
1818		250 per year	Long Term
TOTAL:	3,315		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Loan:			
Active			
1785	1,000		
1815	1,000		
1910	1,000		
TOTAL:	3,000		
Inactive			
1695	225	325 per year	Long Term, as UF_6
1742	200		
1884	275		
TOTAL:	700		
Inquiries to Borrow:			
Active			
1780	500		
1812	800		
TOTAL:	1,300		
Inactive			
1621	300		
1885		600	
1890		500	
TOTAL:	300	1,100	

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MARKET DATA

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Inquiries to Purchase:			
Active			
1410		1,500 per year	5 M lbs. Total
1699	500		
1744	1,000		
1842		500 per year	2 M lbs., start 85
1868	300	300 per year	Long Term
1871	250	250 per year	1983-86
1896	100		UF_6
TOTAL:	2,150		
Inactive			
1459		200 per year	Long Term
1634	400		
1841	100		
1888		500 per year	Long Term
1889		500 per year	Long Term
TOTAL:	500		

[1] Measured from the date of this Report.

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MARKET DATA

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
Active			
1584	350	300 per year	Long Term
1607	1,000		
1609	500	1,500 per year	Long Term
1684	450		
1840	300		
1886	500		
TOTAL:	3,100		
Inactive			
1451	75		
1619		300	
1661	200		
1764	100		
TOTAL	375		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
Active			
1622	500	900	
1896	100		
TOTAL:	600		
Inactive			
1594	400	450 per year	Long Term
TOTAL:	400		

[1] Measured from the date of this Report.

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1737	82	50-100	102	unknown	Europe	
1740	82	less than 50	98	US	US	
1741	82	101-300	102	US	US	
1750	82	0-50	98	US	US	
1758	82	301-600	101	US	US	
1761	82	101-300	102	US	Europe	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks
1746	1983	301-600	100	US	Europe	

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[1] Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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MARKET ANALYSIS

FORECAST OF URANIUM PRODUCTION

This Report presents Nuexco's latest forecast of uranium production for the world outside Communist areas (WOCA). Those forecasts are quantified in Tables 1, 2 and 3. Table 1 summarizes Nuexco's forecast of US production of U_3O_8 for centers operating or under construction as of December 31, 1981. Table 2 shows Nuexco's forecast of world U_3O_8 production by region; Table 3 contains the same production estimates segmented according to status of the production center.

Production centers are divided into categories, according to stage of development, as follows:

1. Operating production centers — those which have shipped U_3O_8 in commercial quantities on or before December 31, 1981.

2. Production centers under construction — those which were being built as of December 31, 1981, and which have an established access to ore reserves. Conventional production centers are included in this category only if mill construction has actually begun.

3. Planned production centers — those for which firm development and construction commitments had been made as of December 31, 1981, and which Nuexco believes will be economically viable based on Nuexco's most recent price forecast.

Each category is further divided, according to source, as follows:

1. Conventional milling
2. Unconventional recovery methods:
   - — Solution mining, including *in situ* leaching and hydraulic mining
   - — Phosphoric acid by-product recovery
   - — Heap leaching, including leachings of tailings and copper dumps

The forecast detailed in Table 1 calls for annual US production to decline from 38.7 million pounds U_3O_8 in 1981 to about 28 million pounds in 1982. The forecast calls for that twenty-eight percent decline to be followed by a further decline of twenty-four percent next year, so that 1983 US production of U_3O_8 will only slightly exceed 21 million pounds U_3O_8. That level is almost exactly half as much as the 1980 peak of almost 43 million pounds U_3O_8. The forecast calls for the US U_3O_8 production rate to decline to about 18 million pounds per year in 1985 through 1988 and then to decline to 13 million pounds per year by 1991. As in previous Nuexco forecasts, the decrease is due to declining ore grades, depletion of orebodies and production cutbacks due to high costs and low prices. Other factors important to the forecast are:

1. Nuexco's belief that US utilities will not be willing to subsidize high-cost US producers by paying a substantial premium for US-origin U_3O_8.

2. Nuexco's belief that the US government will not erect barriers to the importation of large quantities of uranium, up to two-thirds of annual *unfilled* requirements of US utilities.

The forecast detailed in Table 2 calls for WOCA uranium production to total approximately 108 million pounds in 1982, down slightly from the 1981 level of approximately 112 million pounds U_3O_8. The forecast calls for the total to decline slightly over the next four years, but to remain above 100 million pounds throughout the next ten years. Increased demand for uranium in the mid-1980s would raise prices and stimulate production. That influence accounts for the forecast production increases in the latter half of the period, from 109 million pounds U_3O_8 in 1987 to 117 million pounds in 1991. As US production declines, other production will increase, so that the US portion of the total declines steadily from 26 percent in 1980 to 17 percent in 1985 and 11 percent in 1991.

The reasons behind Nuexco's forecast of declining US production, briefly discussed in this article, have been detailed in previous Reports. However, the reasons for other producers' ability to expand production under the same market conditions bear repeating. The reasons include:

1. The continuing decline in spot market prices has affected uranium producers in the rest of the world more slowly and to a lesser extent than in the US.

2. Outside the US, these effects have so far been limited to a few commercial producers of uranium, as opposed to captive producers.

3. Some older non-US production facilities can be expected to phase out due to the same pressures of high cost and low grade which affect US producers, but the resulting decreases in production will be more than offset by new production from high-grade reserves in Canada and Australia.

4. Production arising from facilities captive to aggressive national nuclear power programs will also help to offset the forecast decline in US production. Active promotion of nuclear power by the governments of several nations allows them to use longer planning horizons than their US counterparts. Additionally, much of the important production outside the US is

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dedicated to attaining and sustaining national self-sufficiency in the nuclear fuel cycle, at least in nuclear raw materials. For these reasons, much of what might otherwise be excess or economically marginal uranium production outside the US will continue in operation.

The forecast of world production presented herein necessarily reflects some subjective opinions about commercial decisions which will be faced over the next few years by uranium producers. The decisions include whether to:

1. Continue funding some projects already under construction;
2. Expand exploration programs, terminate them or to continue them at some intermediate level;
3. Postpone or terminate planned expansions;
4. Continue uneconomic or marginal mining and milling operations in the hope of near term improvement in the spot market price;
5. High-grade where possible, in effect sacrificing mine life for short-term improvements in average cost of production;
6. Divest themselves of less attractive mining or milling operations;
7. Withdraw altogether from uranium mining and milling.

Those decisions will be based on many factors, but the ultimate outcome of production decisions will most probably be determined by the economics of free market competition. The major exceptions will be certain producers captive to electric utilities or national nuclear power programs.

Table 1

US URANIUM PRODUCTION FORECAST
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Operating										
Conventional Mills	20.0	13.7	12.3	11.1	12.2	12.5	12.5	11.5	11.0	9.5
Unconventional Sources	7.3	6.5	5.7	5.5	4.6	4.5	4.4	4.0	3.5	3.4
Subtotal:	27.3	20.2	18.0	16.6	16.8	17.0	16.9	15.5	14.5	12.9
Under Construction (as of December 31, 1981)	0.7	1.0	1.0	1.0	1.0	0.8	0.8	0.8	0.4	0.4
TOTAL	28.0	21.2	19.0	17.6	17.8	17.8	17.7	16.3	14.9	13.3

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MARKET ANALYSIS

Table 2

WORLD URANIUM PRODUCTION FORECAST[1]
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Australia	11.1	10.3	10.3	8.2	7.0	8.4	11.2	14.0	14.0	17.0
Canada	18.9	21.4	23.4	23.2	28.2	29.7	30.7	30.7	30.7	34.7
Central Africa[2]	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4
France	6.7	7.1	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Namibia	10.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Republic of South Africa	16.5	17.6	18.4	18.3	18.1	17.8	17.8	17.8	17.8	17.8
Other Nations[3]	2.5	4.0	4.0	4.0	4.0	4.0	4.0	3.6	3.6	3.5
Non-US Total	79.6	83.8	87.1	84.7	88.3	90.9	94.7	97.1	97.1	104.0
US[4]	28.0	21.2	19.0	17.6	17.8	17.8	17.7	16.3	14.9	13.3
TOTAL (rounded)	108	105	106	102	106	109	112	113	112	117

[1] Outside Communist areas
[2] Niger and Gabon
[3] Argentina, Belgium, Brazil, Chile, Mexico, Portugal, Spain and others
[4] This report, Table 1

Table 3

WORLD URANIUM PRODUCTION FORECAST[1]
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Operating										
US	27.3	20.2	18.0	16.6	16.8	17.0	16.9	15.6	14.5	12.9
Non-US	77.6	75.9	75.0	72.6	72.3	73.4	73.4	73.4	73.4	73.4
Subtotal	104.9	96.1	93.0	89.2	89.1	90.4	90.3	89.0	87.9	86.3
Under Construction										
US	0.7	1.0	1.0	1.0	1.0	0.8	0.8	0.8	0.4	0.4
Non-US	1.9	4.8	6.0	6.0	6.0	6.1	6.0	5.6	5.7	5.6
Subtotal	2.6	5.8	7.0	7.0	7.0	6.9	6.8	6.4	6.1	6.0
Planned										
US	0	0	0	0	0	0	0	0	0	0
Non-US	0	3.0	6.0	6.0	10.0	11.4	15.2	18.0	18.0	25.0
TOTAL (rounded)[2]	108	105	106	102	106	109	112	114	112	117

[1] Outside Communist areas
[2] Any inconsistencies between this table and Table 2 are due to rounding.

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MARKET ANALYSIS

FORECAST OF APPARENT FUTURE CONSUMPTION

This Report presents Nuexco's forecasts of Apparent Future Consumption of U_3O_8 and installed nuclear electric generating capacity, as of December 31, 1981. As used by Nuexco, the term "consumption" refers to U_3O_8 entering (at the conversion facility) the pipeline for eventual fabrication into nuclear fuel. The forecasts are quantified in Tables 4 and 5, respectively.

These forecasts differ only slightly from those presented in Report 159, reflecting a substantially smaller change than might have been expected based on the public record. Virtually all of the cancellations and schedule delays which have been announced in the past 18 months had already been incorporated into the forecasts published in Reports 147 and 159.

As of 1982, Europe is the buyer region having the highest consumption rate of uranium. European consumption is forecast to exceed US consumption in 1982 by fifteen percent. The Nuexco forecast calls for that margin to increase to twenty percent by 1991.

Methodology

The methodology used in developing Nuexco's forecasts of Apparent Future Consumption and installed nuclear electric generating capacity is summarized below:

1. Tails assay is assumed to be 0.20 percent U_{235}. For each increase of 0.05 percent U_{235} in the tails assay, U_3O_8 consumption rises by approximately nine percent.

2. Capacity factor for each reactor is forecast according to elapsed time since that reactor's date of commercial operation. The method is based upon the application of historical capacity factor data to a power curve of the form,

$$y = a\ x^b$$

where:

y = annual capacity factor in percent;
x = years since date of commercial operations;
a and b are empirically determined constants.

It is a commonly held belief that achievable capacity factor varies with reactor size. Nuexco grouped the world's reactors according to region and type (US LWRs, CANDUs, European LWRs, AGRs, etc.)

Applying a simple regression analysis to historical operating data, Nuexco determined the constants a and b for each grouping of reactors. In the range of 150 MWe to 1,250 MWe, differences in reactor size had no significant effect on capacity factor, within the limits of the analysis. Using this method of predicting capacity factor reduces forecast consumption by a worldwide average of approximately ten percent.

3. Reactor physics improvements are incorporated into the forecast as indicated in Table 6 for PWRs. Similar data apply to BWRs.

The two principal forces stimulating the development of more efficient fuel are:

a. Competition among fuel fabricators, particularly for reload fuel orders. This has led to more efficient fuel designs being proposed by the fabricators.

b. The trend toward refueling cycles of eighteen months or longer.

Each of these forces acts to increase the energy content in a given fuel rod. The effect is to reduce the uranium weight in the fuel rod or to increase the average fuel exposure or both. Of course, these changes lead to increases in average levels of enrichment and in the average expected capacity factor. Thus, essentially all important variables in the uranium consumption calculation for reload fuel (and initial core fuel to a lesser extent) will change. These changes in fuel design variables apply to essentially all plants which entered commercial operation after January 1969.

The INFCE report referenced in Table 6 discusses nine methods for improving uranium utilization in LWR plants:

a. Increased burnup (MWD/MTU)
b. Lattice changes
c. Spectrum shift
d. Enrichment zoning, including blankets
e. Full use of early batches of startup core
f. Improved fuel management and control design
g. End-of-cycle coastdown
h. Reconstitution/inversion of BWR fuel
i. Increased frequency of refueling

The INFCE report postulated improvements ranging from 15 to 30 percent. Nuexco, believing that the INFCE targets were too optimistic for general application to LWR plants, chose lower improvements for the forecast. For example, Table 6 postulates improvements of 3.4 percent by 1985 and 9.7 percent by 1990 for PWR plants. Nuexco's assumption of modest improvements in uranium utilization was implemented wholly by increasing fuel exposure. That approach allowed for progress in the other eight areas of potential fuel improvement, but recognizes that, in reality, all fuel parameters would have to be considered in the design process.

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MARKET ANALYSIS

A similar approach was followed for heavy water reactor plants, where modest improvements in uranium utilization were assumed by 1985, but larger gains were instituted by 1990 through the use of slightly enriched uranium (1.20 percent U_{235}) in reload fuel. For conservatism, no improvements were assumed for gas-cooled reactor plants.

4. Factors considered in forecasting additions to installed capacity are:

a. Construction progress to date for individual nuclear plants and the owner utility's construction experience for conventional as well as nuclear units;

b. The owner utility's financial condition and the estimated likelihood of relief from ratemaking bodies;

c. Forecasts of growth in demand for electricity;

d. Societal constraints, such as the active opposition of anti-nuclear pressure groups;

5. Uranium is deemed to have been consumed when it has entered the conversion-enrichment-fabrication pipeline for ultimate use in a reactor.

6. Reactor loading is calculated for each reactor type, based on its particular reactor physics.

7. The forecasts assume that:

a. U_3O_8 deliveries for first cores predate commercial operation by two years;

b. U_3O_8 delivery for each reload predates refueling outage by 18 months.

8. Using the assumptions listed above, the consumption for a given reactor can be computed as a function of thermal power, capacity factor, fuel exposure, enrichment level, process losses, tails assay and commercial operating date.

9. Actual commercial operating dates can vary widely from published dates. Nuexco uses the best information available, much of it from unpublished sources, to prepare its own forecasts of operating dates. Such information often changes more frequently than does public information; Nuexco attempts to anticipate such changes as much as possible.

Limitations

Limitations of the forecasts detailed in Tables 4 and 5 are as follows:

1. Forecasts of Apparent Future Consumption are not forecasts of actual uranium demand. Rather, these forecasts comprise a portion of uranium demand more commonly referred to as reactor demand or reactor requirements. As indicators of the amount of uranium which will be needed to fuel the reactors under consideration, these forecasts should be regarded as relatively hard demand in the sense that this portion of demand is quite insensitive to uranium prices. Market demand for the assumed pattern of capacity additions can be higher or lower, depending on users' inventory policies.

2. Factors which can cause demand to exceed Apparent Future Consumption are:

a. Utility buyers plan their procurement strategies to achieve a very high probability of having access to at least enough uranium to meet commitments as they arise;

b. Accelerated reactor construction schedules can advance the dates of uranium need;

c. Buyers may elect to purchase uranium in excess of need, simply to enhance security of supply;

d. Utility obligations to suppliers of fuel cycle services such as conversion, enrichment or fabrication, may require earlier purchase of uranium than a reactor's operating schedule would otherwise indicate.

3. Demand can fall short of Apparent Future Consumption if uranium inventories are reduced in order to fill needs which would otherwise appear as demand.

4. Reactors fueled by the USSR are excluded from Nuexco's forecasts. Although Soviet bloc reactors account for substantial demand, Soviet participation in uranium trading in the Western market has been negligible and appears likely to remain so.

5. Nuexco forecasts include provisions for some US reactor plant orders which have not yet been placed, but they have no effect on consumption or installed capacity until after 1991. Nuexco forecasts include provisions for the startup of some reactors not yet ordered in France and Japan. Those units are included based on the shorter construction cycles prevalent in those countries. Also, their planning and approval processes are such that substantial site and engineering planning is done before actual orders are placed.

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Table 4

APPARENT FUTURE CONSUMPTION[1]
(millions of pounds U_3O_8)

Buyer Group	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
United States										
Reactors Now Operational	17.8	18.4	18.6	18.8	18.8	18.7	18.7	18.5	18.3	18.3
Now Under Construction	3.5	9.8	9.9	12.6	17.2	16.9	18.4	19.7	19.4	17.8
Now On Order/Planned	0	0	0	0	0	0	0	0	0	0
US Subtotal	21.3	28.2	28.5	31.4	36.0	35.6	37.1	38.2	37.7	36.1
Europe										
Reactors Now Operational	17.9	19.0	19.9	20.3	20.5	20.6	20.2	19.4	19.0	19.0
Now Under Construction	6.6	17.1	13.2	14.3	19.0	19.4	19.5	20.1	18.2	18.5
Now On Order/Planned	0	0	0	0	0	0	5.1	4.3	2.9	5.8
Europe Subtotal	24.5	36.1	33.1	34.6	39.5	40.0	44.8	43.8	40.1	43.3
Far East[2]										
Reactors Now Operational	4.2	4.1	4.0	3.9	3.8	3.7	3.6	3.4	3.3	3.3
Now Under Construction	2.5	1.5	5.7	5.8	5.0	6.1	5.6	4.4	4.1	4.1
Now On Order/Planned	0	0	0	0	1.1	0.9	1.7	2.5	3.1	3.1
Far East Subtotal	6.7	5.6	9.7	9.7	9.9	10.7	10.9	10.3	10.5	10.5
Other Free World[3]										
Reactors Now Operational	2.1	2.1	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.7
Now Under Construction	1.9	3.2	3.2	3.4	4.0	4.1	3.7	3.0	3.4	3.4
Now On Order/Planned	0	0	0	0	0.7	0.6	0.7	2.3	3.0	2.4
Other Subtotal	4.0	5.3	5.3	5.4	6.7	6.6	6.2	7.1	8.1	7.5
FREE WORLD[3] TOTAL:	56.5	75.2	76.6	81.1	92.1	92.9	99.0	99.4	96.4	97.4
Worldwide Breakdown by Status										
Reactors Now Operational	42.0	43.6	44.6	45.0	45.1	44.9	44.3	43.1	42.3	42.3
Now Under Construction	14.5	31.6	32.0	36.1	45.2	46.5	47.2	47.2	45.1	43.8
Now On Order/Planned	0	0	0	0	1.8	1.5	7.5	9.1	9.0	11.3

---

[1] Computed quantities of U_3O_8 which would be used under the given conditions to fabricate fuel for loading and reloading reactors operating, under construction or on order as of December 31, 1981. Compiled and computed on a reactor by reactor basis, quantities for each reactor are based on specific core characteristics, 0.20% tails assay, no recycling, 24-month lead time for procuring first cores and 18-month lead time for procuring each reload. Where reload schedule is not already known, these estimates assume reloads occur one year after commercial operation date and annually thereafter. Nuexco forecasts capacity factor for each reactor as a function of reactor type, country of operation and time since startup.

[2] Japan, Korea, Taiwan

[3] Excludes Bulgaria, Czechoslovakia, German Democratic Republic, Finland (two Russian reactors), Hungary, People's Republic of China, Poland, Romania, USSR

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Table 5

NUCLEAR ELECTRIC GENERATING CAPACITY[1] [2]
(thousands of MWe — net)

Buyer Group	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
United States										
Reactors Now Operational	55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8
Now Under Construction	3.9	8.4	14.1	23.0	28.2	34.8	41.9	48.7	54.3	59.5
Now On Order/Planned	0	0	0	0	0	0	0	0	0	0
US Subtotal	59.7	64.2	69.9	78.8	84.0	90.6	97.7	104.5	110.1	115.3
Europe										
Reactors Now Operational	53.2	53.2	53.2	53.2	52.6	52.6	52.3	50.5	49.1	49.1
Now Under Construction	4.6	14.9	19.6	31.2	38.2	42.3	49.8	55.5	61.6	64.1
Now On Order/Planned	0	0	0	0	0	0	0	0	5.3	7.5
Europe Subtotal	57.8	68.1	72.8	84.4	90.8	94.9	102.1	106.0	116.0	120.7
Far East[3]										
Reactors Now Operational	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
Now Under Construction	0	2.2	4.2	5.1	9.3	12.3	14.0	15.8	18.6	18.6
Now On Order/Planned	0	0	0	0	0	1.1	1.1	1.9	2.9	3.8
Far East Subtotal	19.4	21.6	23.6	24.5	28.7	32.8	34.5	37.1	40.9	41.8
Other Free World[4]										
Reactors Now Operational	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Now Under Construction	.6	2.1	4.7	7.8	9.6	11.3	13.5	14.7	14.7	14.7
Now On Order/Planned	0	0	0	0	0	0	0.6	0.6	1.5	3.6
Other Subtotal	7.3	8.8	11.4	14.5	16.3	18.0	20.8	22.0	22.9	25.0
FREE WORLD[4] TOTAL	144.2	162.7	177.7	202.2	219.8	236.3	255.1	269.6	289.9	302.8
Worldwide Breakdown by Status										
Reactors Now Operational	135.1	135.1	135.1	135.1	134.5	134.5	134.2	132.4	131.0	131.0
Now Under Construction	9.1	27.6	42.6	67.1	85.3	100.7	119.2	134.7	149.2	156.9
Now On Order/Planned	0	0	0	0	0	1.1	1.7	2.5	9.7	14.9

[1] Installed as of year end

[2] Uses Nuexco's estimate of commercial operating dates

[3] Japan, Korea, Taiwan

[4] Excludes Bulgaria, Czechoslovakia, German Democratic Republic, Finland (two Russian reactors), Hungary, People's Republic of China, Poland, Romania, USSR

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Table 6

COMPARISON OF THIRTY YEAR URANIUM REQUIREMENTS (MTU/GWe) FOR PWR PLANTS OF CURRENT AND IMPROVED DESIGN BETWEEN INFCE[1] AND NUEXCO[2]

		Nuexco Assumption for Plants Operating in:		INFCE Improved Design Leading to Uranium Savings of:	
	Current Design	1985	1990	15%	30%
INFCE[1] (MTU/GWe)	4,350			3,700	3,040
Nuexco[2] (MTU/GWe)	4,350	4,200	3,930		
Relative Improvement (%)	Base	3.4	9.7	15	30

[1] International Nuclear Fuel Cycle Evaluation, International Atomic Energy Agency, Vienna, 1980: Volume 8, Advanced Fuel Cycle and Reactor Concepts, Report of INFCE Working Group 8, pages 53-67. Adapted from Table V (page 67).

[2] Nuexco data normalized to INFCE conditions.

SUPPLY AND DEMAND ANALYSIS

The supply-demand analysis resulting from Nuexco's most recent forecasts of production and consumption of uranium is presented in Table 7 (WOCA) and Table 8 (US). Conclusions which may be drawn from the analysis include the following:

1. Table 7 shows forecast production exceeding forecast consumption in each year through 1991, implying that supply and demand will be balanced by an annual net increase in inventory. In actual practice, if supply exceeded demand over an extended period, the necessary balance would probably result from a combination of inventory purchases and reduced production.

2. The forecast inventory of approximately 426 million pounds of U_3O_8 equivalent as of January 1, 1982 represents more than five years of forward consumption. Inventory will increase steadily throughout the next ten years until it reaches approximately 630 million pounds U_3O_8 equivalent by 1991. Relative inventory is quite stable, however, increasing gradually from 5.5 years' forward consumption in 1982 to 6.5 years' forward consumption in 1991.

3. New reactor orders or political or national policy considerations may generate enough additional demand to absorb production from production centers planned, but not yet under construction. However, it is more likely that a major driving force behind any such additional production entering the market will be the displacement of other higher-cost production centers.

Table 8 shows Nuexco's analysis of forecast uranium supply and demand balance for the US. By reviewing the US situation alone, any potential market for imports or new US production can be identified. The analysis in Table 8 is of the same basic form as that of Table 7 (WOCA), but the US analysis includes an adjustment for US import-export commitments. Based on the US supply-demand balance, it may be concluded that:

1. In the US, consumption is forecast to exceed production annually, beginning in 1983. Forecast uranium production declines steadily throughout the period to less than half of the 1982 level. On the other hand, Apparent Future Consumption increases by approximately 50 percent between 1982 and 1985. Between 1985 and 1990, Apparent Future Consumption increases by about one-sixth, so that forecast Apparent Future Consumption in 1991 is almost triple forecast US production of U_3O_8.

2. Table 7 shows an annual US supply deficit beginning in 1983 and rising to more than 21 million pounds U_3O_8 in 1990 and 1991. Without additional imports or more US production, US inventory would decline to a level equivalent to approximately 18 months' forward consumption by 1990 or 1991.

Methodology

1. The two most critical assumptions in this analysis are:

a. Outside the US, supply and demand will be balanced by inventory accumulation and increased exports to the US, rather than by reducing production.

b. In the US, supply and demand will be balanced by inventory liquidation and increased imports, rather than by increasing production. It is possible that some US

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utilities' preference for domestic supply will induce them to subsidize some otherwise uneconomic US production, but Nuexco's interpretation of US utilities' attitudes indicates that this effect will be neither widespread nor substantial.

2. Another critical variable in the supply-demand analysis is the degree to which producers having existing contracts will elect to purchase rather than produce uranium. This applies especially to US producers, since the average cost of production in the US is above market price.

3. Inventory refers to uranium (U_3O_8, natural UF_6, enriched UF_6) owned by utilities, reactor manufacturers, fuel fabricators and national organizations which procure uranium for commercial purposes. The inventory amounts do not include strategic stockpiles, such as those owned by the US DOE. Difficulties in accounting precisely for the variety of possible forms, location and ownership of inventory necessarily result in some uncertainty in estimating total world inventory. Nuexco's estimate of worldwide inventory as of the beginning of 1982 is approximately 426 million pounds U_3O_8 equivalent; however, the uncertainty factor of this estimate is ten to fifteen percent. More important is the fact that the primary conclusions of this analysis are not sensitive to beginning inventory variations of ten to fifteen percent.

4. The analysis assumes that US utilities will be able to buy approximately one-third of their *unfilled* requirements from domestic sources.

Table 7

URANIUM SUPPLY-DEMAND BALANCE: FREE WORLD[1]
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
PRODUCTION[2]										
Operating Production Centers	104.9	96.1	93.0	89.2	89.0	90.4	90.3	89.0	87.9	86.3
Facilities Under Construction	2.6	5.8	7.0	7.0	7.0	6.9	6.8	6.4	6.1	6.0
Planned Facilities	0.0	3.0	6.0	6.0	10.0	11.4	15.2	18.0	18.0	25.0
Total	107.5	104.9	106.0	102.2	106.0	108.7	112.3	113.4	112.0	117.3
less										
CONSUMPTION[3]	56.5	75.2	76.6	81.1	92.1	92.9	99.0	99.4	96.4	97.4
equals										
NET INVENTORY INCREASE	51.0	29.7	29.4	21.1	13.9	15.8	13.3	14.0	15.6	19.9
plus										
BEGINNING INVENTORY	426.1[4]	477.1	506.8	536.2	557.3	571.2	587.0	600.3	614.3	629.9
equals										
ENDING INVENTORY	477.1	506.8	536.2	557.3	571.2	587.0	600.3	614.3	629.9	649.8
RELATIVE INVENTORY (years)[5]	5.5	5.6	5.7	5.7	5.8	5.9	6.0	6.1	6.3	6.5

---

[1] Excludes Communist areas
[2] This report, Table 2
[3] This report, Table 4
[4] Nuexco estimate
[5] For each year, Relative Inventory equals the number of years' forward consumption which could be supplied by that year's Beginning Inventory.

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MARKET ANALYSIS

Table 8

URANIUM SUPPLY-DEMAND BALANCE: US
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
PRODUCTION[1]	28.0	21.2	19.0	17.6	17.8	17.8	17.7	16.3	14.9	13.3
less										
CONSUMPTION[2]	21.3	28.2	28.5	31.4	36.0	35.6	37.1	38.2	37.7	36.1
plus										
NET IMPORTS/(EXPORTS)[3]	0.2	0.8	2.1	(0.3)	1.3	0.5	1.0	1.1	1.1	1.3
equals										
SUPPLY SURPLUS/(DEFICIT)	6.9	(6.2)	(7.4)	(14.1)	(16.9)	(17.3)	(18.4)	(20.8)	(21.7)	(21.5)
plus										
BEGINNING INVENTORY	162.3[4]	169.2	163.0	155.6	141.5	124.6	107.3	88.9	68.1	46.4
equals										
ENDING INVENTORY	169.2	163.0	155.6	141.5	124.6	107.3	88.9	68.1	46.4	24.9
RELATIVE INVENTORY[4]	5.5	5.3	4.8	4.4	3.9	3.4	2.8	2.4	1.8	1.3

[1] This report, Table 1

[2] This report, Table 4

[3] Nuexco Report 163, Table 5

[4] Nuexco estimate

[5] For each year, Relative Inventory equals the number of years' forward consumption which could be supplied by that year's Beginning Inventory.

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CLUFF LAKE PROJECT — PART I

Introduction

Following the discovery of four uranium deposits in the Cluff Lake area of Northern Saskatchewan between 1967 and 1975, Amok, Ltd. perceived that a large development program would follow.

The Cluff Lake project actually had its beginning in 1964 when Amok, operating as Mokta Ltd. (Canada), began low-key uranium exploration in the Beaverlodge area north of Lake Athabasca. By 1967, Amok was conducting airborne radiometric surveys of about 15,000 square kilometers in three separate locations within the Athabasca Basin. Amok began a systematic survey in the vicinity of the Carswell Dome, located near the western edge of the basin about mid-1967. The Carswell Dome was selected as a prime target area because of obvious structural deformation of the Athabasca Formation. A number of low-intensity radiometric anomalies were detected within the structure near Cluff Lake in late 1967. Follow-up ground evaluation of the anomalies resulted in the discovery of high grade mineralized boulders in 1968. Amok immediately registered 13 claim blocks covering 120,000 acres within the domal structure. Figure 1 is a location map of the Cluff Lake area showing the relationship to other uranium deposits in the Athabasca Basin.

Subsequent detailed geologic exploration by Amok, including core drilling, led to the discovery of the high-grade "D" zone deposit in 1971. Exploration continued and by early 1975, several more important orebodies had been discovered. Two of the largest were designated as the "N" and the "Claude"; the final deposit was designated the "O-P" orebody. Total uranium reserves in the project area at that time were estimated by Amok at about 23,000 metric tons of uranium oxide. Since then, Amok's exploration program has made significant additions to the ore reserve total.

The Company

Mokta Ltd. (Canada) was formed for the sole purpose of exploring for uranium throughout Canada by its parent company, Compagnie de Mokta, in 1964. The name of the exploration company was changed to Amok, Ltd. (Canada) and was incorporated under a federal statute of the Canada Corporations Act in December 1967. The principal shareholders of Amok, Ltd. (Canada) are Compagnie de Mokta, Compagnie Francaise des Minerais d'Uranium, and Pechiney Ugine Kuhlman, S.A. and Commissariat a l'Energie Atomic.

Project operations were carried out under the company alignment described above until early 1980 when Saskatchewan Mining Development Corporation (SMDC), a Crown Corporation wholly-owned by the government of Saskatchewan, acquired a 20 percent undivided interest in the project. Following lengthy negotiations, SMDC agreed to make a payment of C$65 million to Amok, Ltd. In addition, SMDC agreed to pay 20 percent of all project costs retroactive to July 1, 1979. The joint venture ownership now consists of two companies:

1. Amok, Ltd. (Canada)		80%
Compagnie Francaise de Mokta	37%	
Commissariat a l'Energie Atomic	30%	
Pechiney-Ugine-Kuhlman	25%	
Cogema	8%	
2. Saskatchewan Mining Development Corporation		20%

The project is now operating under the new partnership as Cluff Mining.

Project Development

Amok, Ltd. had determined the presence of large quantities of uranium in four ore deposits at Cluff Lake by early 1975. Plans for project development were initiated almost immediately and on November 24, 1976, Amok, Ltd. submitted an Environmental Assessment and Safety Report for the project to the Saskatchewan Department of Environment. The Report was a comprehensive assessment of environmental, health and safety, and the social and economic effects of a uranium mining and milling project at Cluff Lake as proposed by Amok.

As a result of the Amok proposal, which at the time was not a condition for obtaining the necessary mining permits and licenses, the Minister of the Environment requested a public inquiry to review the Report for "broader and global implications" of an expanding uranium industry in Saskatchewan. On February 1, 1977, the Cabinet of Saskatchewan appointed a commission to conduct an inquiry concerning all aspects of the project. Known as the "Cluff Lake Board of Inquiry," the three member Board immediately engaged in the task.

The scope of the Inquiry was primarily twofold: to determine the environmental, economic and social impact of the Cluff Lake mine and mill project on a local and regional level, including the expansion of the uranium industry in Saskatchewan; and to render a decision whether the project should proceed, or proceed subject to specific conditions and recommendations.

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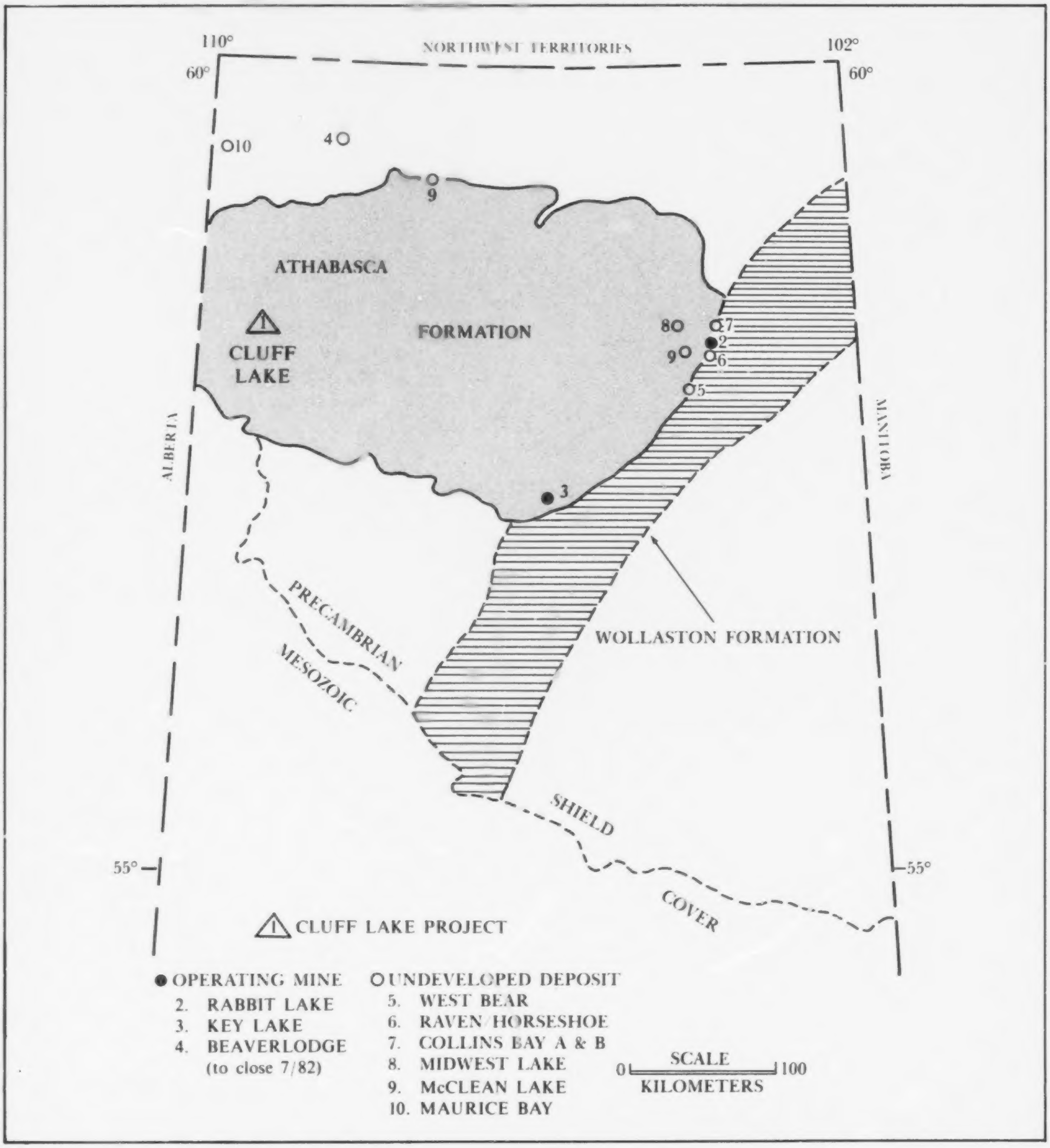
110°
NORTHWEST TERRITORIES
102°
60°
60°
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4
9
ATHABASCA
FORMATION
CLUFF
LAKE
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3
ALBERTA
MANITOBA
PRECAMBRIAN
MESOZOIC
WOLLASTON FORMATION
SHIELD
COVER
55°
55°
CLUFF LAKE PROJECT
● OPERATING MINE
2. RABBIT LAKE
3. KEY LAKE
4. BEAVERLODGE (to close 7/82)
○ UNDEVELOPED DEPOSIT
5. WEST BEAR
6. RAVEN HORSESHOE
7. COLLINS BAY A & B
8. MIDWEST LAKE
9. McCLEAN LAKE
10. MAURICE BAY
SCALE
0
100
KILOMETERS

Figure 1

LOCATION OF THE CLUFF LAKE PROJECT WITH RELATION TO OTHER URANIUM DEPOSITS IN THE DISTRICT, NORTHERN SASKATCHEWAN

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The Board examined in depth all measures proposed by Amok regarding the health and safety of workers, the present and future environmental aspects of mining and milling, the economic, social and political considerations, plus a number of related issues that would develop during the life of the project.

The Board made specific recommendations relative to the different aspects of the project, many of which were in addition to the measures proposed by Amok. Perhaps the most significant recommendation relates to the emphasis placed on benefits to northern residents. The Board stressed the importance of royalty sharing to generate funds for permanent area development, plus a plan to increase the northerners' participation in the initiation, coordination and direction of economic and social development in northern Saskatchewan. The direct intent was to give the northerners more "control over their own lives." The Department of Northern Saskatchewan (DNS) assumed jurisdiction in such matters.

The Board submitted the final Report to the Cabinet on May 31, 1978. The Board's recommendation to proceed with the project was accepted by the government. Negotiations between DNS and Amok proved satisfactory and in September 1978, DNS approved a surface lease giving Amok the right to begin project development.

The surface lease covers 9,500 acres in the vicinity of the ore deposits and allows the necessary space for mine and mill sites and all support facilities. By accepting the lease, Amok assumed full obligation to operate within the designated area according to the terms and conditions of environmental and regulatory requirements of Canadian and Saskatchewan law.

Immediately after the surface lease was issued, Amok began development of the "D" orebody. Mill construction was started almost simultaneously with mine development. The construction schedule was accelerated following many months of delay, and finally initial production of uranium concentrate began in midsummer 1980.

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STATISTICAL DATA

EXCHANGE VALUE $22.50/lb. U_3O_8
Determined as of March 31, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

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[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of March 31, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
23.40	2.8	12	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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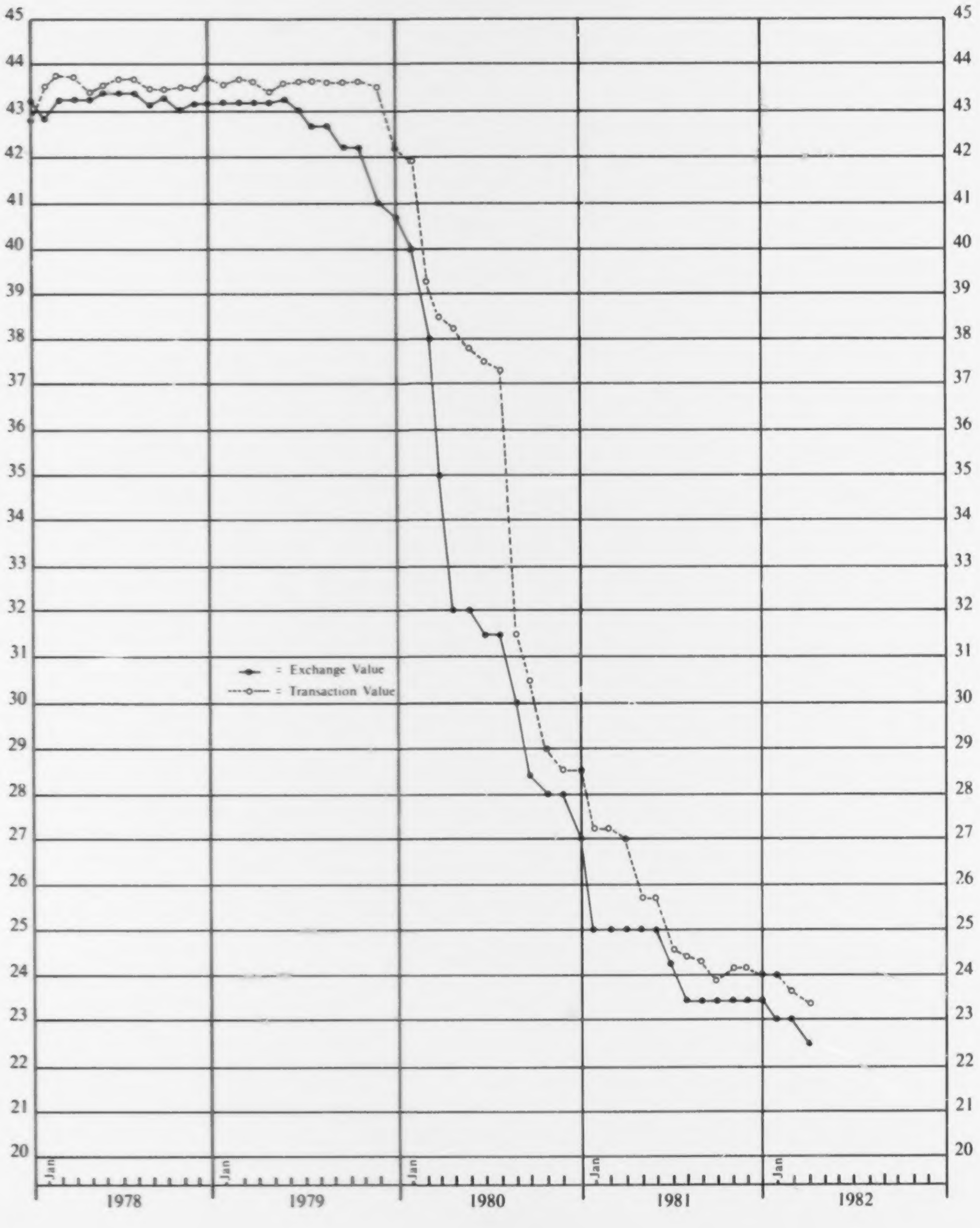
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50									

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40									

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	22.50	49.60	58.50
France (franc)	140.19	309.06	364.45
FRG (mark)	54.18	119.44	140.85
Japan (yen)	5,526	12,182	14,365
Switzerland (franc)	43.39	95.67	112.82
UK (pound)	12.61	27.80	32.78
Australia (dollar)	21.39	47.17	55.62
Canada (dollar)	27.60	60.84	71.75
Niger, Gabon (CFA)	7,031	15,501	18,280
South Africa (rand)	23.62	52.08	61.41
Sweden (kroner)	133.85	295.09	347.98

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of March 31, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of March 31, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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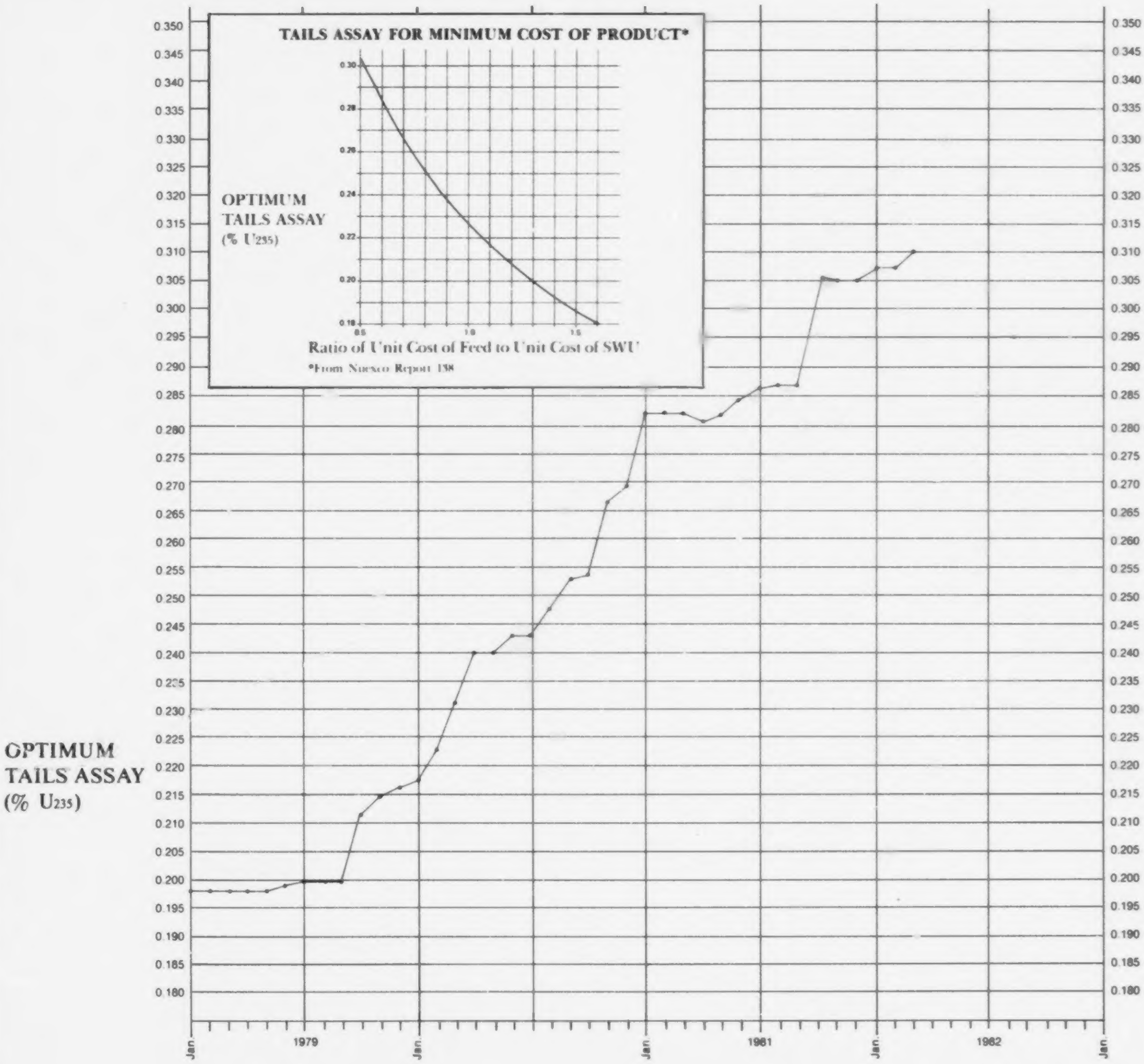
STATISTICAL DATA

OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE 1980 AFC SWU price; interpolated to the nearest thousandth.

STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.01
Annual Avg. 1981	355.2	235.55R
Nov 1980	350.4	221.50
Dec 1980	351.7	222.41P
Jan 1981	357.8	230.58P
Feb 1981	356.6	230.41P
Mar 1981	355.2	229.66P
Apr 1981	354.6	229.38P
May 1981	353.4	237.31P
Jun 1981	360.4	237.62P
Jul 1981	356.9	237.54P
Aug 1981	359.7	237.54P
Sep 1981	357.2	237.51P
Oct 1981	351.4	238.95R
Nov 1981	350.2R	240.65R
Dec 1981	348.7P	256.43R
Jan 1982	353.7P	256.20P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Nov 1980	257.8	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3	11.27	8.51	8.90
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.5	11.47	8.63	9.17
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0	11.99	8.90	9.49
Jun 1981	272.3	12.03R	9.16	9.57
Jul 1981	274.3	12.07R	9.20	9.62
Aug 1981	276.1	12.19R	9.15	9.63
Sep 1981	276.8R	12.63	9.22	9.77
Oct 1981	279.0R	12.82	9.35	9.91
Nov 1981	278.5R	12.89R	9.45R	9.89R
Dec 1981	279.5R	12.87P	9.46P	10.06P
Jan 1982	281.0P	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1970[3]	7.34	100.3[4]	—	655,346	399,164
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3,6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3,6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3,6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Oct 1980	—	186.3	203.1	720,246	204,602
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6R	724,604R	251,502R
Oct 1981	—	213.4R	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	—	—	272.4	193.71R	11.59	11.97	9.12	—
Apr 1981	303.5	293.4	266.8	—	11.30	11.63	8.94	7.51
May 1981	304.7	294.1	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1	294.5	271.3	191.06	11.31	11.88	9.07	7.60
Jul 1981	306.2	296.0	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.2	296.2	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	307.4R	295.7R	279.3	195.61	12.11	12.68	9.38	7.79
Oct 1981	309.0R	296.1R	279.9	—	12.09	12.43	9.37	7.84
Nov 1981	309.1P	295.5P	280.7	—	12.14	12.47	9.42	7.86
Dec 1981	310.1P	295.9P	281.5	200.10R	12.09R	12.44R	9.52R	7.93R
Jan 1982	311.7P	298.2P	282.5	—	12.24P	12.60P	9.67P	8.00P
Feb 1982	311.4P	298.5P	283.4	—	—	—	9.66P	8.03P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	**Last Month**	**12 Months Ago**
	(Referenced to March 31, 1982)		
Exchange Value[1]	22.50	23.00	25.00
Transaction Value[1]	23.40	23.70	27.00
Conversion Value[2]	1.20	1.20	1.20
Loan Use Charge Rate[3]	6%	6%	7%
Near-Term Uranium Supply[4]	11.2	10.9	8.3
Near-Term Uranium Demand[5]	2.2	3.3	2.1
Near-Term Supply-Demand Ratio	5.2	3.3	4.0
Optimum Tails Assay[6]	.310	.307	.279
Current Transactions[7]:			
Number of Transactions	6	4	4
Quantity of Material[8]	0.6-1.4	1.3-2.5	4.7-8.5

[1] US $ per pound U_3O_8 equivalent
[2] US $ per pound U as UF_6
[3] Percent per annum
[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6] Percent U_{235}
[7] Uranium transactions only; does not include loans or conversion transactions
[8] Millions of pounds U_3O_8, equivalent

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STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Co., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas

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PERSONNEL

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NUEXCO REPORT 164
EXECUTIVE SUMMARY

Exchange Value Decreases 50 Cents to $22.50

The **Exchange Value** as of March 31, 1982 is $22.50 per pound U_3O_8. The decline of 50 cents from last month reflects the market response to the appearance of aggressive new sellers. As near-term supply has risen, sellers have demonstrated a willingness to cut prices to conclude transactions.

Near-Term Supply Increases

Additional sellers entered the spot and near-term markets during March, offering substantial amounts of material. *Active* sellers in the zero to one year time frame are offering 11.2 million pounds U_3O_8. *Active* uranium demand in the same period amounts to only 2.2 million pounds U_3O_8. The ratio of near-term supply to near-term demand for uranium is 5.2:1 as of March 31, 1982. Material offered for sale by utility inventory holders accounts for **95 percent** of the spot and near-term uranium supply available from *active* sellers. Material being sought by parties not primary users represents 70 percent of the spot and near-term demand for uranium by *active* buyers.

Transaction Value Decreases Thirty Cents to $23.40

The **Transaction Value** as of March 31, 1982 is $23.40 per pound U_3O_8. It includes twelve transactions totaling 2.8 million pounds U_3O_8 and covers a period of three months.

Six Uranium Sales Reported

Six uranium sales are reported. They include 0.6 million to 1.4 million pounds U_3O_8. All six involved US sellers; all six called for delivery this year. Four buyers were US and two were European.

Conversion Value Steady at $1.20

One conversion transaction is reported. It is likely that substantial additional conversion will soon become available in the secondary market.

Market Data Format Revised

The listings of uranium and conversion supply and demand appearing in the *Market Data* section have been revised to differentiate between *active* and *inactive* situations.

Australia's Jabiluka Project Gets Marketing Approval

Pancontinental, 65% owner of Jabiluka, reached agreement with the Northern Land Council on production royalties for the Jabiluka project. A scant three weeks later, the government gave Pancontinental permission to begin marketing efforts.

Production Forecast Revised

Nuexco's latest forecast of uranium production shows the world total declining slightly throughout the next ten years. Sharp declines in US production will be offset by increases in Canada and Australia.

Consumption Forecast Revised

Nuexco's latest forecast calls for European consumption of uranium to exceed US consumption in 1982 by 15%. That margin is forecast to increase to 20% by 1991.

Supply-Demand Balance Revised

Nuexco's latest forecast calls for worldwide uranium inventories to rise steadily from the current level of 5.5 years' forward consumption to 6.5 years' forward consumption in 1991. Annual US production shortfalls, beginning in 1983, will be offset by inventory depletion and increased imports. In the rest of the world, supply and demand will be balanced by inventory accumulation and increased exports, rather than by reducing production.

Cluff Lake Project Discussed

The *Raw Materials* section focuses on the development of Canada's Cluff Lake project, owned by Amok Ltd. and SMDC.

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MAY 1982 NUMBER 165

Monthly Report on the Uranium Market

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NUEXCO

MONTHLY REPORT ON THE URANIUM MARKET

May 1982 No. 165

R. WESLEY MILLER *EDITOR*

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FOREWORD

Enclosed with this Report is a copy of a speech presented by George White, Jr., at the AIF Fuel Meeting on March 22, 1982 in New York City.

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of April 30, 1982 is $20.75 per pound U_3O_8, down $1.75 from last month's level of $22.50.

This downward adjustment reflects the deteriorating condition of the spot and near-term markets. Trends evident last month accelerated. The ratio of near-term supply to near-term demand widened sharply from 5.2:1 last month to 9.3:1 this month. Not only did supply increase, but demand was reduced as one large order was filled. Also evident was an increased willingness of sellers (both utilities and producers) to cut prices to compete for available business.

It seems likely that prices will remain under pressure so long as available supply in the near term continues to overwhelm near-term demand. The continuing deterioration of the spot and near-term markets is increasing the divergence between spot prices and prices more typically discussed under longer-term contracts. This situation must, in time, lead to additional producers buying or early procurement by utilities seeking to fill longer-term needs.

The **Transaction Value** as of April 30, 1982 is $22.60 per pound U_3O_8, down $0.80 from March. April's Transaction Value includes 13 transactions totaling 3.6 million pounds U_3O_8 and covers a period of 3 months.

Three uranium sales are reported this month:

1. A Far East user purchased from an unidentified party less than 50,000 pounds U_3O_8 for delivery in 1983 in the form of UF_6.
2. A US producer purchased 601,000 to 1,000,000 pounds U_3O_8 for immediate delivery. The ultimate seller was a US utility.
3. A US producer purchased 101,000 to 300,000 pounds U_3O_8 for immediate delivery. The seller was another US producer.

The **Conversion Value** as of April 30, 1982 is $1.20 per pound U as UF_6, unchanged from last month. The conversion market remains quiet.

The **Loan Use Charge Rate** remained at six percent.

AFRICA

In another unusual break with tradition, officials of Western Areas Gold Mining Company announced in late March, at the official opening of their new uranium plant, that a West German power company, Nordwest Deutsche Kraftwerk (NWK), had purchased a substantial portion of the mine's uranium output under a long-term contract. The contract, concluded through Nufcor in early 1980, provided for an interest free loan of 30 million Rand to assist in financing the plant.

Output is estimated at about 1,250,000 pounds U_3O_8 annually. Although specific contract details are not available, comparable contracts written by other South African producers have provided for the delivery of up to 80 percent of output to major customers. Deliveries to NWK will not begin until 1983; 1982 production will be stockpiled or sold in the spot market as opportunities arise.

Western Areas is administered by Johannesburg Consolidated Investment Group which also administers Randfontein Estates.

Last month, Nuexco reported that Japanese utilities (since learned to include Kansai and perhaps Shikoku and Kyushu) had contracted for a major portion of Beisa's production. The current announcement would seem to confirm earlier speculation that the unprecedented publicity given to the identities of South Africa's uranium customers is designed to reassure existing and potential customers of South Africa's reliability and commitment to long-term uranium supply.

AUSTRALIA

Energy Resources of Australia (ERA)'s Ranger uranium mine produced approximately 1.7 million pounds U_3O_8 during the first quarter of 1982, a rate of about 95 percent of its nominal capacity. The current production rate is slightly above nominal capacity and it is quite likely that ERA will reach its 1982 target of seven million pounds U_3O_8. Ranger output during the period mid-August 1981 to the end of March 1982 was approximately 4.3 million pounds U_3O_8.

Jabiluka's developer, Pancontinental Mining Ltd., is experiencing delays in the ratification of its agreement with the Northern Land Council (NLC) by the aboriginal landowners. The NLC negotiated with Pancon and Getty Oil Co., the joint venture partners, and initialed the agreement on behalf of the local landowners on February 27, 1982. Before the agreement can go into effect, it must be ratified by the landowners. That had been expected to be fairly automatic, but the landowners now say they need more time to consider details of the agreement.

A policy shift by the Australian Workers Union (AWU) in South Australia may be bolstering the prospects of the Roxby Downs project. Until recently,

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the state's opposition party had maintained a solid anti-uranium stance, but the state AWU decision to support uranium development appears as a first crack in the unity of local opposition to uranium mining in South Australia. The policy reversal brings the state AWU in line with national AWU policy and provides union support for workers employed on the large copper, gold and uranium deposit at Roxby Downs. The South Australian Parliament is considering an indenture bill authorizing the mining of the Roxby Downs deposit. The project, owned by Western Mining Corp. (51%) and British Petroleum Australia Ltd. (49%), has estimated ore reserves of 250,000 tonnes U_3O_8.

The South Australian Uranium Corp., a joint venture owned by Oilmin N.L. (16.6%), Petromin N.L. (16.6%), Transoil N.L. (16.6%) and Western Nuclear Ltd. (50%), will be filing its environmental impact statement in May for the development of the Beverly deposit. The statement proposes to mine reserves of 15-16,000 tonnes U_3O_8 by in situ leaching methods.

Urangesellschaft Australia Pty., Ltd. (UGA), operator of the Westmoreland joint venture in northern Queensland, began a substantial drilling program on the property in April designed to discover higher grade uranium reserves. The project is owned by Queensland Mines Ltd. (40%), CSR (12.75%), UGA (37.5%) and I.O.L. Petroleum (9.75%). Based on geological evidence, the partners believe there is a high probability of discovering better grades. Results are expected in October at the end of this field season.

A year ago, reserves at Westmoreland were reported as follows (millions of pounds U_3O_8):

Proven	1.9
Probable	13.6
Possible	7.9

The average grade was reported to be 0.17% U_3O_8. CSR recently offered its equity in Westmoreland for sale.

CANADA

In a surprise move, Eldorado Nuclear announced on April 28, 1982 that they had executed a memorandum of principal terms under which Eldorado will purchase from Gulf Oil all of the outstanding shares of Gulf Minerals Canada Limited in return for uranium concentrates from Eldorado's inventory.

In practical terms, this means that Gulf has traded its interest in the Rabit Lake mine and mill, the Collins Bay and Eagle Point orebodies, and assorted other uranium properties in return for most of the Canadian stockpile. Discussions have been in progress for about a year.

From Gulf's viewpoint, the move allows them to import now the Canadian material that is needed for the Westinghouse settlements and probably skirts the upgrading issue that had been impeding Gulf's efforts to import U_3O_8 rather than UF_6.

For Eldorado, of course, the purchase provides a solid new base of production now that Beaver Lodge is scheduled for shutdown this summer. It is believed that Eldorado will also inherit those contracts with non-US customers that were scheduled to be supplied from Gulf's share of Rabit Lake.

To the extent that the Canadian stockpile is fed by Gulf into the hands of consumers, inventories in the US will be increased. Although it is not known whether the stockpile transfer will be immediate or over several years, something like ten or twelve million pounds will move from a government stockpile to user stockpiles where much of it will be considered excess.

FAR EAST

New data on Japan's nuclear plans became available this month, updating and expanding the information provided last month in Report 164. At the request of the Agency for Natural Resources and Energy (ANRE), the nine electric utilities and JAPC submitted their proposed nuclear plant construction plans. ANRE (a part of MITI) will review these proposals to develop a long range energy policy.

The utility response calls for 54 reactors providing a nuclear generating capacity of 46,619 MWe to be in operation by March 31, 1991. The breakdown is presented in Table 2.

Table 2

SUMMARY: JAPAN UTILITIES' NUCLEAR POWER PLANS

Category	Reactors[1]	Gross MWe[1]
In operation	23	16,077
Under construction	10	9,544
Planned (authorized)	8	7,263
Planned (not authorized)	13	13,735
	54	46,619

---

[1] PNC's operating Fugen ATR (165 MWe) and authorized Monju FBR (280) MWe) are excluded from this compilation.

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As ANRE studies the plan summarized in Table 2, it will likely realize that the utility plans are too ambitious in the later years. Table 3 presents a breakdown of the planned utility construction status.

Table 3

PLANNED UTILITY CONSTRUCTION SCHEDULES

Year of Planned Operation	Under Construction	Planned (Authorized)	Planned (Not Authorized)	Total
1982	1	—	—	1
1983	—	—	—	0
1984	3	—	—	3
1985	4	—	—	4
1986	2	1	—	3
1987	—	1	—	1
1988	—	2	—	2
1989	—	2	1	3
1990	—	2	9	11
first qtr. 1991	—	—	3	3
Total	10	8	13	31

Counting the two units (Genkai-2 and Ikata-2) already placed in service in 1982, a total of 19 units are scheduled for operation in the eight year period 1982-1989. That amounts to an average of 2.4 units and about 2,200 MWe per year. By contrast, 14 units representing more than 14,000 MWe are scheduled for 1990 and early 1991. Such an accomplishment seems unlikely. A more realistic scenario would be a continuation of the historical trend. This would result in some 44 or 45 units (as opposed to 54) and some 36,000 to 37,000 MWe (as opposed to 46,600 MWe) in service by March 31, 1991.

Last month, Report 164 projected Japan's annual rate of uranium consumption by 1990 at about 14 million pounds U_3O_8. Based on the revised utility plans, forecasts of Japan's 1990 rate of uranium consumption should be reduced to approximately ten million pounds U_3O_8 per year.

UNITED STATES

April was an active month for US producers. Plateau Resources Ltd., a wholly owned subsidiary of Consumers Power, began operations at its Shootaring Canyon, Utah mill on April 13, 1982. The initial milling rate is expected to be 580 tons per day, with mining continuing at a rate of 600 tons per day. Beginning head grade will be about 0.10 percent.

Dawn Mining restarted operations at its Washington state Midnite mine which had been shut down for the winter. Mill operations had continued throughout that time, running on stockpiled ore.

Exxon shipped the last ore from its Felder mine in Texas to the Conquista mill where it has a tolling arrangement with Conoco and Pioneer. The Felder mine is considered mined out and now is closed permanently.

Union Carbide Corporation repeated its 1981 strategy and suspended operations at its Uravan, Colorado mill for 5 months beginning in mid-April. Union Carbide has determined that, given conditions unique to the Uravan mill, it is more economical to operate at full capacity for half the year than 50 percent capacity year round to meet its supply commitments. Plans call for the mill to resume production by October, 1982.

Cogema's purchase of General Electric's subsidiary, Pathfinder Mining Company, was completed March 26, 1982 with the transfer of 80 percent of Pathfinder's stock to the French company. GE reported that the sale was at

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"approximately book value." It is expected that Pathfinder will retain its current management and name. It is also expected that Cogema's US uranium subsidiary, Framco, will be absorbed by Pathfinder or dissolved, centralizing all of Cogema's US operations under a single organization.

The Washington Public Power Supply System (WPPSS), under pressure from the Bonneville Power Administration (BPA), suspended construction on WPPSS Unit 1 (61 percent complete and previously scheduled for commercial operations in 1986).

Recently, BPA released its electrical usage forecast for the Pacific Northwest, concluding that the area will eventually need the 3 nuclear power units its partner, WPPSS, has under construction. However, given the units' current construction schedule, there would be excess capacity for some time. Therefore, the BPA recommended that WPPSS suspend construction on WNP 1 while completing WNP 2 and 3 as quickly as possible.

The suspension is scheduled to last two to five years, but if the present political and economic conditions persist, WPPSS will encounter formidable obstacles to the resumption of construction. The demise of WNP 1 means that only two of the five WPPSS nuclear power plants are still under construction.

Portland General Electric withdrew its site license application for its planned nuclear power units Pebble Springs 1 and 2, effectively cancelling those units. These units were not included in Nuexco's uranium consumption forecast published in Report 164.

Six months ago, in October 1981, USNRC chairman Palladino stated he thought up to 20 nuclear power plants could be licensed in 1982.

The NRC staff recently reported to the commissioners that there may be only 5 nuclear power units licensed in 1982, with a maximum of 20 over the next two years. The difference comes from delays in completion dates by the utilities as well as regulatory problems, as happened with Pacific Gas & Electric's Diablo Canyon 1 unit.

The plants Nuexco believes have a realistic chance of being licensed this year are as follows:

Reactor	**Utility**	**Scheduled Operating Date**
San Onofre 2	So. Calif. Edison	June 1982
LaSalle 1	Commonwealth Edison	June 1982
Summer	So. Carolina E&G	August 1982
Grand Gulf 1	Mississippi P&L	December 1982

*Published in the Nuclear News World List of Nuclear Power Plants as of December 31, 1982.

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Sale:			
ACTIVE			
1575		500 per year	Long Term
1584	500		
1637	300		
1739	1,600		
1769A	130		UF_6
1818		250 per year	Long Term
1872	1,100	400	
1877	50		
1895	1,800		some UF_6
1900	2,000		
1906	290		
1909	2,200		UF_6
1916	2,000		UF_6
1925	500		UF_6
1930	500		
TOTAL:	12,970		
INACTIVE			
1581B		150 per year	Long Term
1610	200		
1664	100		
1774	50		
1804	615		
1805		500	Long Term
1810	750		
1812A	500		
1814	250		
TOTAL:	2,365		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
ACTIVE			
1742	500		
1785	1,000		
1815	1,000		
1884	275		
1910	1,000		
1919	2,000		
1931	600		
TOTAL:	6,375		
INACTIVE			
1695	225	325 per year	Long Term, as UF_6
1927	1,700		
TOTAL:	1,925		
Inquiries to Borrow:			
ACTIVE			
1780	260		
1812	500		
TOTAL:	760		
INACTIVE			
1621	300		
TOTAL:	300		

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MARKET DATA

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Inquiries to Purchase: ACTIVE			
1410		1,500 per year	5 M lbs. Total
1699	500		
1744	160		
1842		500 per year	2 M lbs., start 85
1868		300 per year	Long Term
1871	250	250 per year	1983-86
1915		500	UF_6
1917	150		
1923	30		
1924	300		
TOTAL:	1,390		
INACTIVE			
1459		200 per year	Long Term
1634	400		
1841	100		
1888		500 per year	Long Term
1889		500 per year	Long Term
1914	200		
TOTAL:	700		

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[1] Measured from the date of this Report.

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MARKET DATA

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6) 0 to 1 Year	Delivery Period[1] (Thousands of Pounds U as UF_6) Beyond 1 Year	Remarks
ACTIVE			
1584	350	300 per year	Long Term
1607	1,000		
1609	500	1,500 per year	Long Term
1840	300		
1886	500		
1921	1,700		
1925	450		
TOTAL:	4,800		
INACTIVE			
1451	75		
1619		300	
1661	200		
1764	100		
1902		350	
TOTAL	375		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6) 0 to 1 Year	Delivery Period[1] (Thousands of Pounds U as UF_6) Beyond 1 Year	Remarks
ACTIVE			
1622	700	900	
1896	100		
TOTAL:	800		
INACTIVE			
1594	400	450 per year	Long Term
TOTAL:	400		

[1] Measured from the date of this Report.

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1776	83	less than 50	108	non-US	unknown	UF_6
1777	Immediate	601-1000	98	US	US	
1784	Immediate	101-300	98	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks

There are no conversion transactions reported this month.

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[1] Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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REPUBLIC OF SOUTH AFRICA

First quarter 1982 production figures from South African gold-uranium operations are presented in Table 1.

Table 1

REPUBLIC OF SOUTH AFRICA: Production from Gold-Uranium Operations; First Quarter 1982

Operation	Thousands of Pounds U_3O_8
Blyvooruitzicht	164
Buffelsfontein	320
CHEMWES	336
Dreifontein Consolidated	129
ERGO	149
Harmony	316
Hartebeestfontein	239
J.M.S.	591
Randfontein	245
Vaal Reefs	756
Western Areas	58
Western Deep Levels	101
TOTAL	3,404

First quarter 1982 output was approximately four percent less than that of the fourth quarter 1981.

The scheduled production buildup of the Beisa section of St. Helena was hampered by continued underground intersections of large quantities of water. No production figures were released for the quarter.

Palabora does not release quarterly production figures, only sales. Sales for the quarter increased from 14,378 kgs to 157,572 kgs U_3O_8 concentrates, reflecting the delivery of material to a new customer during the quarter.

Some observations about some individual uranium operations during calendar year 1981 and the first quarter of 1982 appear in the following paragraphs.

Chemwes (Gencor)

During the first quarter of 1982, the average grade of slimes declined 10.5 percent. The higher grade Buffelsfontein slime Chemwes was treating has been virtually depleted as planned.

Randfontein (JCI)

1. During the first quarter of this year, production was adversely affected (down 12 percent) by the cessation of operations at the Millsite plant and by plant operating difficulties, since overcome.

2. During 1981 Randfontein treated 3.35 million tons for uranium. The yield of 0.177 kg per ton produced 592 tons U_3O_8, 8.5 percent less than 1980's 646 tons.

3. Randfontein has largely attained its objectives of full utilization of metallurgical facilities and optimum recovery efficiencies for both gold and uranium. The aim to produce all contractual requirements for the delivery of U_3O_8 from the Cooke section should be achieved when Cooke No. 3 shaft is brought into full production.

4. Extraction efficiency of the uranium section of the Cooke plant improved by 24 percent. A solvent extraction plant is being constructed to replace the existing ion-exchange section and further improve recoveries. The uranium section of the Millsite plant has been shut down and equipment is being maintained in working order.

5. Working profit from sales of uranium dropped to R12.034 million from R22.532 million. This resulted from lower production as well as lower profitability due to increased treatment costs. Moreover, profits from sale of U_3O_8 bought from other producers to meet contractual commitments is credited to sundry revenue and not included above.

Vaal Reefs (Anglo American)

1. During the first quarter of 1982, production declined 12 percent due to problems which had beset the South Uranium plant for the past several years. Those problems are being overcome by the replacement of the fiberglass absorption columns with stainless steel columns. Full production is expected to be restored momentarily.

2. 8.5 million tons were treated for uranium during 1981. At a yield of 0.20 kg per ton, they produced 1,694 tons U_3O_8 (64 tons less than 1980).

3. Operations of the pressure leach pilot plant sited at the East Gold Plant were suspended in June 1981 in order to redesign the heat recovery system and install the necessary modified equipment. Testwork is expected to resume this year.

4. Major items for the pressure leach plant at the South Uranium plant are being dispatched to the site by suppliers, and the civil work on the project has been completed. Further construction and expenditure were

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temporarily suspended in mid-year until further technical test work has been completed. Construction probably will be resumed before the end of this year.

5. Commissioning of the 200 tons per day oxygen plant sited at the South Division commenced in February 1982.

6. The uranium and pressure leach plants in the South Lease area were financed in part by a consumer loan obtained by Vaal Reefs in conjunction with a uranium sale. The consumer loan was fully utilized during 1981. During the year, the contract was renegotiated to reduce the annual rate of delivery of uranium oxide and to extend the overall delivery period and, further, to extend the repayment period for the consumer loan beyond December 31, 1983 to June 30, 1985. However, the overall amount of uranium oxide to be delivered under the contract is unchanged.

7. Afrikander Lease Section — During 1981 it was decided, in the light of the continued weakness in the uranium market, to suspend stoping operations once sufficient ore had been stockpiled for the uranium plant to be commissioned, but to continue with shaft sinking and limited prospect development. This will provide access to the higher grade section of the orebody and enable the mine to be brought into production at relatively short notice should the uranium market show signs of improvement. As a result, only 6.4 tons of uranium and 5.3 kilograms of gold were produced during the year.

Commissioning of the uranium section is due to commence in the third quarter 1982 whereafter, depending on the state of the uranium market, a decision will be made on the future operation of the uranium section. In the event that Afrikander lease ore is not mined, ore from the West Division will continue to be treated through the gold plant.

8. Planned production for 1982:

Total	Gold	Uranium
Tons milled, treated	8,900,000	8,400,000
Grade	8.2 g per ton	0.2 kg per ton
Production	73,000 kg	1,650 tons

Included in the above are 2,850,000 tons to be milled in the South Lease area at a recovery grade of 11.0 grams per ton, resulting in gold production of 31,350 kilograms and uranium production from the South Lease area of 750 tons.

During 1982 no production of uranium is planned from the Afrikander Lease area, other than the small amount which will be produced during the commissioning of the plant.

9. Present indications are that the company will not be able to sell its entire uncommitted uranium production in 1982. In his annual report to shareholders Mr. D.A. Etheredge (Chairman of Vaal Reefs and the gold and uranium division of Anglo American) made the following comments on the uranium market:

"Although the uranium market continued to weaken during the past year, the dramatic slide in spot market prices seen during 1980 slowed considerably and there are indications that prices are close to bottoming out if they have not already done so. The major part of your company's uranium production is sold under long-term dollar contracts and, despite further weakening of contractual prices under the influence of the spot market, the decline of the Rand relative to the US dollar has partially protected the uranium income. The factors affecting the supply and demand and depressing the spot price have not changed over the past year, and I am not optimistic that there will be any firming of the spot price or demand in the year ahead."

Western Areas (J.C.I.)

1. Production began in the first quarter of 1982. Stoping on the middle Elsburg Reef Horizon has attained planned levels for the current year. The uranium plant is fully commissioned and, although problems are still being encountered with the filtration section, uranium recovery is expected to increase.

2. Contractual deliveries of U_3O_8 will commence in the first quarter of 1983, with a portion of sales revenue in any quarter being utilized to reduce the capital portion of the consumer loan. Any U_3O_8 produced prior to delivery date and any excess production will be sold as opportunities arise. The third and final R10 million installment of the R30 million interest-free consumer loan was received in the first quarter of 1981.

Western Deep Levels (Anglo American)

1. Uranium production for 1981:

	Tons Treated	Recovery Grade kg/t	U_3O_8 Produced kg
No. 1 Plant	291,904	0.183	53,355
No. 2 Plant	2,038,787	0.078	159,129
	2,330,691	0.091	212,484

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Major process changes were made in an attempt to reduce unit uranium production costs. These changes involved the closing down of the No. 1 uranium plant on May 28, 1981 and the curtailment of production from the low-grade tailings dam. An additional radiometric sorting plant capable of significantly upgrading feed material to the new uranium plant has been commissioned. Benefits from these changes should be evident towards the middle of 1982. As a result of sorting the 200,000 tons per month, No. 2 uranium plant is now able to treat the full Carbon Leader Reef production and the head value has been enriched from 0.15 kg per ton to 0.20 kg per ton. The leaching filtration and clarification facilities of the No. 1 uranium plant have been incorporated into the existing gold plant, thus saving R1.8 million on planned capital expenditure.

2. Planned production for 1982:

	Gold	Uranium
Tons milled, treated	3,200,000	1,770,000
Grade	12.19 g/t	0.126 kg/t
Production	39,000 kg	223 tons

TECHNOLOGICAL DEVELOPMENTS IN NUCLEAR FUEL DESIGN AND UTILIZATION

The International Nuclear Fuel Cycle Evaluation (INFCE) studies were initiated in 1978 by President Carter to seek, among other goals, the conservation of uranium resources. This two-year study by international experts established some dozen technical programs to reduce uranium consumption by 20 percent for PWR reactors and 30 percent for BWR reactors over the next decade.

Concurrent to this study, the US DOE initiated a ten-year research, development and irradiation testing program involving all the domestic fuel fabricators and the cooperating utilities to achieve similar results. The DOE program, now in its fourth year, set more aggressive goals of equivalent 25 percent reduction in uranium consumption for PWR reactors and 35 percent reduction for BWR reactors.

Every two years a conference on Nuclear Fuel Performance and Utilization is held under the auspices of the American Nuclear Society to report progress to date. The latest conference, held this April, included major international participation. Many papers were presented by French, German, British, Japanese and Swedish scientists. *The interim results show that the above goals of 25% and 35% reduction, respectively, in uranium consumption will not only be achieved but have good probability of being exceeded.* There was an air of euphoria and optimism at the conference which has been missing from nuclear conferences since 1972.

The results of such programs have been anticipated in Nuexco's uranium consumption forecasts since the time of the INFCE studies. However, we had discounted the stated goals either in magnitude or time of achievement by setting expectations from the program at 12 percent reduction in uranium consumption for PWR reactors and 22 percent for BWR reactors by 1990. In the next published analysis, even though we will continue to discount the rate of industry incorporation of this progress, Nuexco will consider raising our estimates of attainable increases in fuel efficiency.

An advanced fuel design proof-tested by irradiation of several fuel bundles still faces the formidable obstacle of NRC licensing before it can become a standard product. It also takes time to cycle the several reloads into the reactor to achieve a full core of advanced fuel design; it takes further time until that core reaches the extended burnup levels.

The following paragraphs are intended to give the reader a summary of the scope and diversity of the program and the nature of the technical problems to be overcome.

Program Objectives

The original program had the primary goal of uranium conservation; lower fuel cycle costs were a secondary objective. Increased fuel burnup has long been recognized as a possible way of reducing fuel cycle costs, but the current transition to longer refueling cycles has moved the point of lowest fuel cycle cost to considerably higher fuel exposures than before. This, in turn, led to the recognition that driving fuel to much higher burnup levels would achieve a substantial reduction in spent fuel storage requirements. The reduction in spent fuel storage is now becoming an important driving force toward high burnup programs among electric utilities.

Technical Alternatives

Methods for achieving reduced fuel cycle cost and, secondly, lower uranium consumption include:

1. Extension of fuel batch burnup from 30,000 MWD/MTU to 50,000 MWD/MTU for PWR fuel and from 27,800 MWD/MTU to 45,000 MWD/MTU for

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BWR fuel by use of burnable absorbers and control cell core refueling patterns.

2. Inversion or reconstitution of undepleted fuel rods for reinsertion.

3. Use of thorium to develop near-breeder, non-replaceable fuel assemblies in the outer periphery (25 percent) of the core.

4. Shifting of the neutron spectrum during each cycle by flow control and other methods to increase fissile plutonium generation.

5. Use of axial blankets and low-leakage radial blankets to improve neutron economy.

6. Use of burnable absorbers, such as gadolinia for radial and axial power shaping to achieve uniform fuel burnup.

7. Optimization of refueling patterns to better utilize fissile material.

Without attempting to explain each of the above alternatives, it is important to recognize that there are many choices in achieving the best combinations of variables. Even so, extended burnup has the largest effect.

Technical Problems

The technical problems to overcome are principally these:

1. Internal fuel rod pressure through additional release of fission gases.
2. Fuel pellet swelling and distortion to cause fuel clad rupture.
3. Internal fuel clad chemical attack from fission products such as iodine.
4. External fuel clad corrosion and crud deposition.
5. Fuel rod axial growth and other structural changes.

Technical Solutions

In general, the results to date indicate that the major problems are not a strong function of extended fuel burnup and have proven much less serious than anticipated. Many of the problems can be solved by mechanical design changes and chemical controls, such as:

1. Increased plenum chamber volume in fuel rods to reduce fission gas pressure buildup.
2. Use of 9x9 fuel rod arrays for BWR and 18x18 fuel rod arrays for PWR reactors to reduce heat flux and fuel pellet distortion.
3. Use of a pure zirconium liner inside the Zircalloy fuel clad to eliminate clad rupture from chemical attack.
4. Improved water chemistry to reduce external fuel clad corrosion.

Results to Date

Individual fuel assemblies have now been driven to 43,000 MWD/MTU in BWR plants and 56,000 MWD/MTU in PWR plants without fuel rod failures. Power ramp tests in test reactors of selected high burnup rods have demonstrated reasonable safety margins. Much more testing is in progress. Current work has resulted in the NRC licensing PWR fuel *reloads* for burnups up to 34,000 MWD/MTU, a 13 percent increase over the last several years. Confidence exists that licensing limits can be increased by about 2,000 MWD/MTU per year over the next decade.

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CLUFF LAKE PROJECT — PART II

Phase 1 Development

The Environmental Assessment & Safety Report submitted to the Saskatchewan Department of Environment by Amok, Ltd. on November 24, 1976, included the proposal to develop the property in two phases. Phase I was to include the mining and processing of the D orebody and the construction of necessary support facilities; Phase II would involve later expansion of facilities to handle larger volumes of ore originating from the Claude, N, and O-P orebodies. Granted approval to proceed with the Phase I/Phase II development concept, Amok initiated the Phase I program in September 1978. Figure 1 shows the location of uranium deposits, the mill site and tailings disposal area.

Amok calculated the uranium reserve in the D orebody at 73,000 tonnes ore containing almost 12,000,000 pounds U_3O_8. Certain sections of the orebody contained uranium values up to 29 percent uranium; however, the calculated average was 7 percent. Due to the high uranium content of the ore, special precautions for the safety of the employees had to be taken during the mining and milling process.

The orebody was mined by open-pit methods. However, because of the special precautions, it took eighteen months to prepare the deposit for mining. Before overburden removal could begin, approximately twenty-five acres surrounding the deposit were fenced off. The fenced area was hand-cleared to preserve the ground cover and prevent erosion. The course of a stream was diverted about 1000 feet away from the pit area.

The next step was to strip the orebody of about twenty feet of overburden consisting mostly of loose sand and gravel. Only a few isolated remnants of bedrock covering the ore had to be drilled and blasted. All waste material was stacked in two piles away from the mine site; it is to be used for back-filling the pit when project reclamation begins.

At the time mining began in June of 1980, the estimated life of the mine was 3.28 years. However, mining progressed rapidly and one-third of the ore was mined by October. As scheduled, the mining operation was stopped for the winter and resumed at an accelerated rate in early spring of 1981.

The D orebody was completely mined out by September 1981, well ahead of the original schedule. Figure 2 is a photograph of the D pit soon after it was mined out.

As ore was removed from the pit, it was graded for uranium content and placed on one of three carefully prepared stockpiles. Ore grading 0.30 percent or less U_3O_8 was deposited on stockpile A; material grading 0.30 to 20.0 percent U_3O_8 went on stockpile B; all ore grading above 20.0 percent went into stockpile C. The ore in stockpile C is held in a concrete structure and covered with one meter of sand to minimize the level of radiation. The sand is carefully removed as ore is required for mill feed.

Mining Procedure

Special precautions developed to protect employees during the mining process are unique to the D orebody. The high-grade portions of unmined ore were covered over by one meter of sand until that portion was scheduled for mining. Then, the ore was continuously mined by rows 2.5 meters in width and height, always moving from north to south. A 2.5 meter cube of ore was mined at a time. The sand shield was removed immediately ahead of the mining face and replaced over the next ore layer after the cube was mined out. All mining equipment and personnel worked off the sand cover above and behind the active ore face, thereby minimizing direct contact with the ore. By carefully synchronizing the mining and shielding procedures, only the ore cube being mined was exposed at any given time.

An operating first for Amok included custom designing most mining equipment to be used on the project. Again, safety precautions were the main consideration and equipment was designed with this in mind. All operator cabs on equipment are environmentally controlled by utilizing special air filtration, temperature control and maintaining air pressure 50 percent above outside air. In addition, all equipment has built-in protection against direct radiation. The ore trucks, for example, have a permanent six centimeter thick steel plate between the cab and the ore hopper to protect the driver at all times from radiation created by each load carried. As added protection, each ore truck was equipped with a mechanically-operated lid to prevent loss of material during transport.

Probably the most unique precaution taken by Amok to prevent the spread of radioactive contamination was the clean-up process for equipment leaving the D mine. A system was developed whereby any piece of equipment moving from the mine to a new location was put through a high pressure cold water jet spray wash before leaving the fenced area. Ore trucks, for instance, were com-

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pletely washed, especially the undercarriage, each load. The wash water is immediately drained to a settling pond for later transfer to a lined water treatment pond already containing a larger water volume pumped directly from the open pit.

The water is treated continuously with lime and sodium sulphate to precipitate uranium, radium and other heavy metals. After a retention time of three to four days, the water enters a second lined pond. Barium chloride is added to remove the last traces of dissolved radium. The water eventually enters a nearby creek and flows into Cluff Lake as clean water.

Milling

The site selected for the processing plant is about four kilometers west of the D pit in an area where the natural drainage pattern is to the northwest away from the site. The tailings pond is located north of the mill on a stream drainage system with sufficient topographic relief to allow construction of a suitable dam and containment area. The pond area is large enough to adequately hold all waste material generated during the life of the project.

The Phase I processing plant was designed to process medium- and high-grade ore from the D orebody. Considering the small tonnage involved, the capacity of the mill is about 80 tonnes ore per day. Average processing rate is currently about 74 tonnes ore per day at an average grade of 6.8 percent U_3O_8.

Ore delivered to the mill is handled according to grade. The high-grade ore goes to the primary crusher where it is reduced to particles of less than 10 centimeters in diameter. It is then transferred to the high-grade storage bins. The medium-grade ore which averages 4.0 percent uranium is crushed separately to particles of less than 1.3 centimeters in diameter. It is put through a gravimetric concentration process to produce a concentrate containing about 45 percent uranium and a tailings containing about 0.30 percent uranium. The concentrate is transferred to storage bins and the tailings, or gravimetric residue, are transferred to a stockpile for Phase II processing. Figure 3 is a photograph of the operating mill. The gravimetric concentrate and high-grade ore are crushed and stored under the two domes. The primary mill circuits are housed in the large building on the left.

The high-grade ore and the concentrate are passed to a common rod mill to further reduce the particle size. The well-blended ores are subjected to an acid leach during which all minerals contained in the ore go into solution. The solution is next subjected to a two-stage precipitation and filtration process to remove nuisance minerals of iron, aluminum, molybdenum and thorium. The uranium stays in solution to be treated with magnesium oxide. The uranium precipitates out as magnesium diuranate (yellowcake). The yellowcake is washed and dried for packaging.

All solid and liquid waste material is neutralized with barium choloride and lime prior to being discharged to the tailings pond. The residue resulting from filtration and washing of the solution containing dissolved uraniun contains 99.9 percent of the radium in the ore. This material is neutralized with lime and stored in buried concrete vaults. The tailings and residue storage sites are continuously monitored for radiation and groundwater contamination.

When the project is terminated, the water will be drained from the tailings pond and the surface sealed with an impervious layer. A suitable layer of soil will be placed over the pond area and revegetated as a final safety precaution against radiation and erosion.

Phase II Development

The Phase II program is presently in the final stage of planning. The program will probably be ready for submittal to the Saskatchewan Department of Environment by October of this year. The program will include the expansion of the existing mill to 1500 or 2000 tonnes ore per day. The mill feed will consist of the gravimetric residue from the D deposit, plus ore to be mined from the other deposits in the area. The average grade of the mill feed will be 0.30 percent U_3O_8.

Preparations to mine the remaining deposits are progressing rapidly. The Claude will be mined by open pit, starting with the experimental pit this summer. Underground evaluation of the O-P deposit has been completed; however, it is likely that the deposit will not be mined at this time because the ore grade is considered to be too low in today's market. Engineering is well advanced for the underground development of the N deposit. Ore extends from a depth of about 30 to 170 meters.

Exploration activity has been continuous through the lease area. The Dominique Peter (D-P) deposit was discovered last year and is now being delineated. It is located about midway between the Claude and O-P deposits and is similar to the Claude deposit in size and grade. It is also likely that the D-P deposit will be mined by underground methods. The Phase II program could extend the life of the project by another six to eight years.

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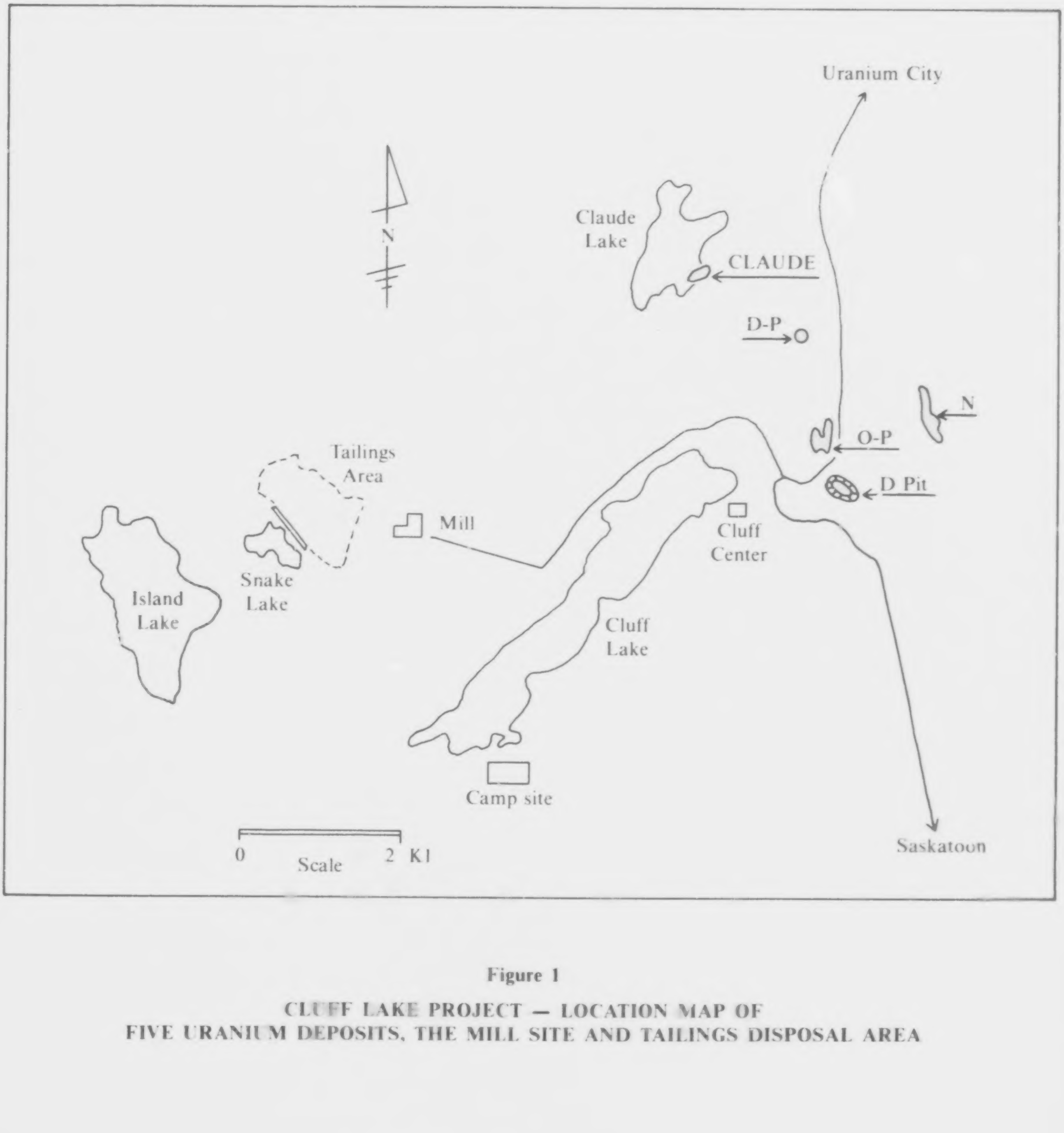
Uranium City
N
Claude Lake
CLAUDE
D-P
N
O-P
D Pit
Tailings Area
Mill
Cluff Center
Snake Lake
Island Lake
Cluff Lake
Camp site
0
Scale
2 Kl
Saskatoon

Figure 1

CLUFF LAKE PROJECT — LOCATION MAP OF FIVE URANIUM DEPOSITS, THE MILL SITE AND TAILINGS DISPOSAL AREA

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RAW MATERIALS

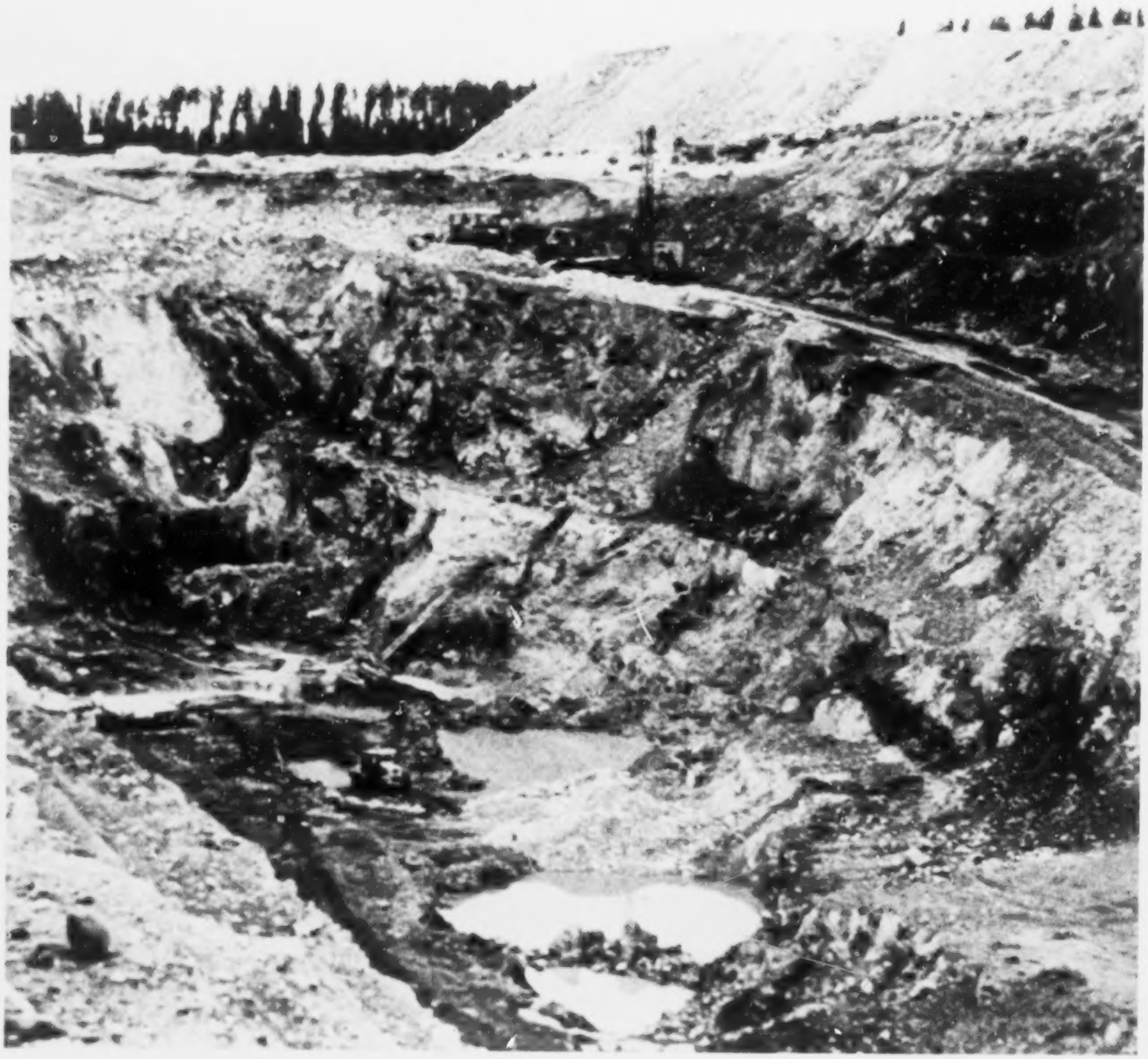

Figure 2

D PIT AS IT APPEARED IN THE FINAL STAGE OF MINING.
APPROX. 107,000 TNS ORE AND 575,000 TNS OVERBURDEN
WERE REMOVED FROM THE PIT.

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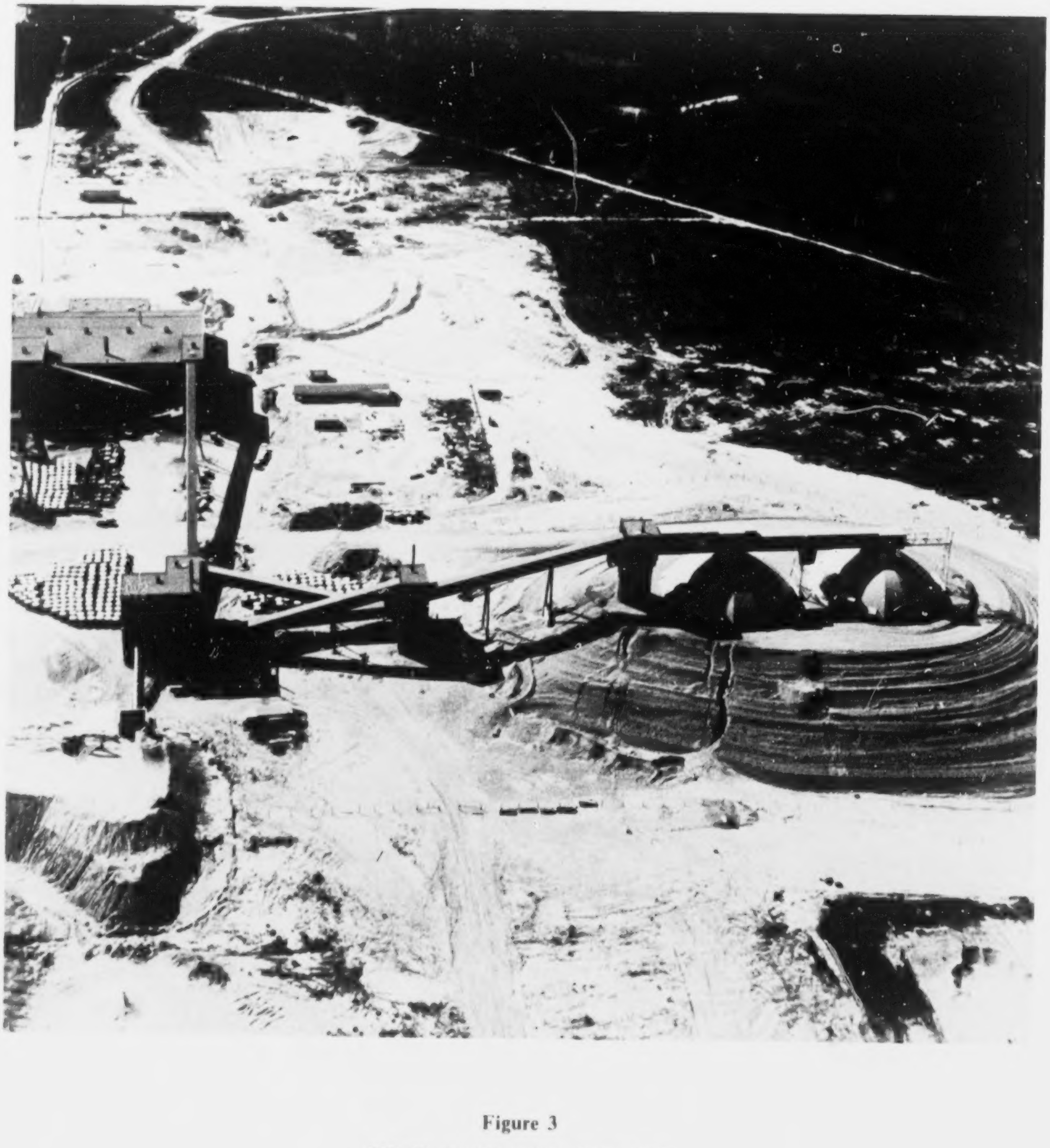

Figure 3

**CLUFF LAKE MILL ON LEFT,
CRUSHED ORE STORAGE ON RIGHT**

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STATISTICAL DATA

EXCHANGE VALUE $20.75/lb. U_3O_8
Determined as of April 30, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:
A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of April 30, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
22.60	3.6	13	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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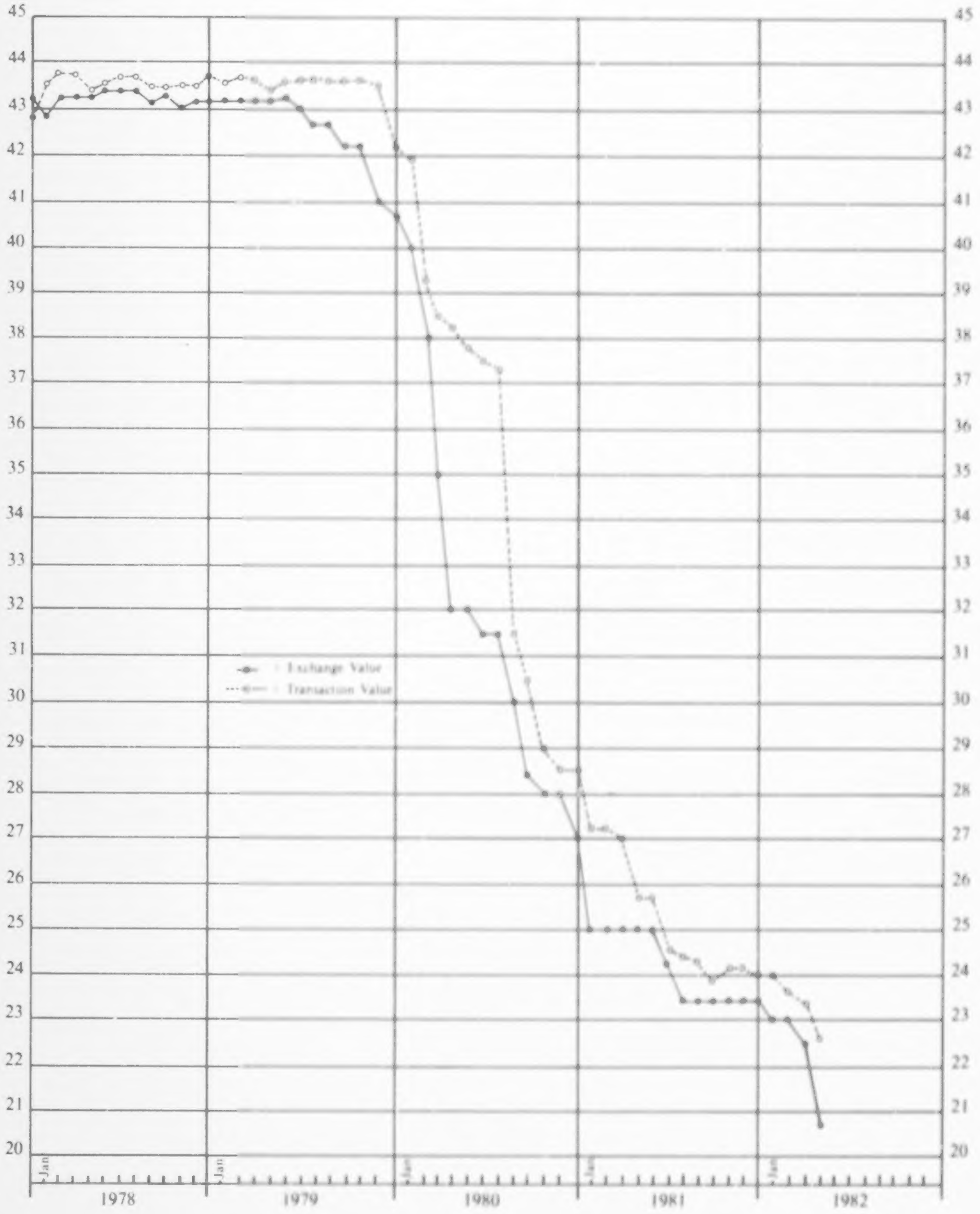
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.09	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75								

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60								

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	20.75	45.75	53.95
France (franc)	127.07	280.13	330.35
FRG (mark)	48.53	106.98	126.16
Japan (yen)	4,900	10,802	12,738
Switzerland (franc)	40.59	89.49	105.53
UK (pound)	11.56	25.49	30.06
Australia (dollar)	19.55	43.09	50.82
Canada (dollar)	25.39	55.97	66.00
Niger, Gabon (CFA)	6,346	13,990	16,497
South Africa (rand)	21.77	48.00	56.61
Sweden (kroner)	121.06	266.90	314.73

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.20/lb. U as UF_6
Determined as of April 30, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of April 30, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00R
Annual Avg. 1981	355.2	236.97R
Nov 1980	350.4	221.50
Dec 1980	351.7	222.41
Jan 1981	357.8	230.58P
Feb 1981	356.6	230.41P
Mar 1981	355.2	229.66P
Apr 1981	354.6	229.38P
May 1981	353.4	237.31P
Jun 1981	360.4	237.62P
Jul 1981	356.9	237.54P
Aug 1981	359.7	237.54P
Sep 1981	357.2	237.51P
Oct 1981	351.4	238.95P
Nov 1981	350.2	240.65P
Dec 1981	348.7P	256.43P
Jan 1982	353.7P	256.20P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	**Primary Metal Industries, non-ferrous (SIC 296-298)**	**Chemicals and Chemical Products (SIC 370-379)**
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Dec 1980	258.4	11.13	8.32	8.92
Feb 1981	263.7	11.43	8.59	9.00
Mar 1981	265.5	11.47	8.63	9.17
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0	11.99	8.90	9.49
Jun 1981	272.3	12.03	9.16	9.57
Jul 1981	274.3	12.07	9.20	9.62
Aug 1981	276.2R	12.19	9.15	9.63
Sep 1981	276.9R	12.63	9.22	9.77
Oct 1981	279.1R	12.82	9.35	9.91
Nov 1981	278.6R	13.01R	9.45	9.89
Dec 1981	279.8R	12.96P	9.42R	10.06P
Jan 1982	281.4R	13.42P	9.59P	10.15P
Feb 1982	282.8P	—	—	—
Mar 1982	284.0P	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3, 6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3, 6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3, 6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	—	—
Feb 1982	—	220.2	236.8	—	—
Mar 1982	45.49	225.2	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.57R	11.97	9.12	7.65
May 1981	304.7	294.1	269.0	—	11.26	11.68	8.99	7.55
Jun 1981	305.1	294.5	271.3	191.06	11.31	11.88	9.07	7.60
Jul 1981	306.2	296.0	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.2	296.2	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	307.4	295.7	279.3	195.61	12.11	12.68	9.38	7.79
Oct 1981	309.0	296.1	279.9	—	12.09	12.43	9.37	7.84
Nov 1981	309.3R	295.5	280.7	—	12.14	12.47	9.42	7.86
Dec 1981	310.1P	295.9P	281.5	200.10	12.09	12.44	9.52	7.93
Jan 1982	311.7P	298.2P	282.5	—	12.21R	12.65R	9.68R	8.02R
Feb 1982	311.4P	298.5P	283.4	—	12.29P	12.58P	9.65R	8.00P
Mar 1982	311.0P	297.9P	283.1	201.88	—	—	9.64P	8.05P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
		(Referenced to April 30, 1982)	
Exchange Value[1]	20.75	22.50	25.00
Transaction Value[1]	22.60	23.40	25.70
Conversion Value[2]	1.20	1.20	1.40
Loan Use Charge Rate[3]	6%	6%	7%
Near-Term Uranium Supply[4]	13.0	11.2	7.1
Near-Term Uranium Demand[5]	1.4	2.2	1.6
Near-Term Supply-Demand Ratio	9.3	5.2	4.4
Optimum Tails Assay[6]	.318	.310	.280
Current Transactions[7]:			
Number of Transactions	3	6	6
Quantity of Material[8]	0.7-1.4	0.6-1.4	7.0-12.0

[1] US $ per pound U_3O_8 equivalent
[2] US $ per pound U as UF_6
[3] Percent per annum
[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6] Percent U_{235}
[7] Uranium transactions only; does not include loans or conversion transactions
[8] Millions of pounds U_3O_8, equivalent

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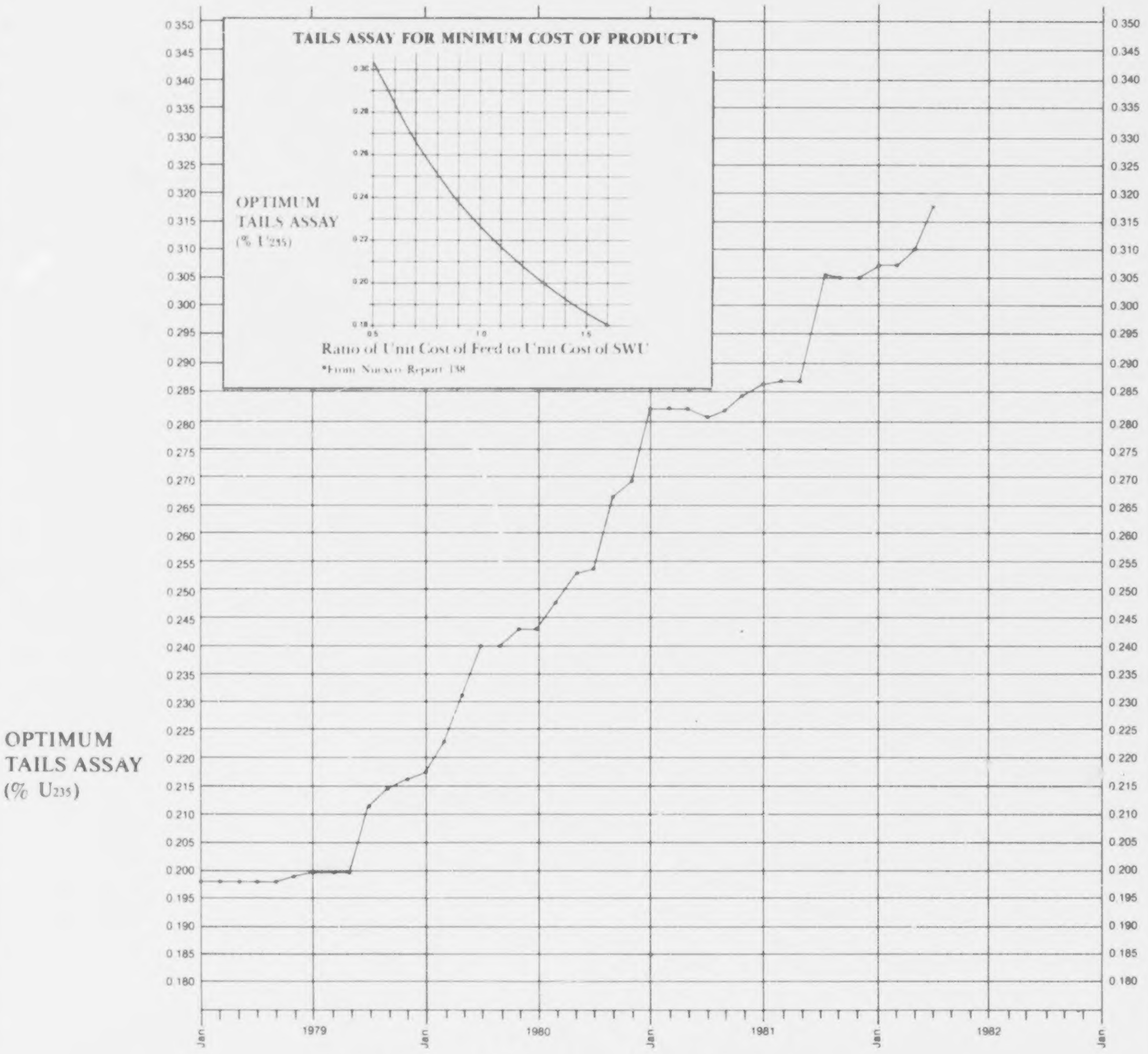
OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE 1980 AFC SWU price; interpolated to the nearest thousandth.

STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Co., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas
FIFO:	First in, First out
LIFO:	Last in, First out

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NUEXCO REPORT 165
EXECUTIVE SUMMARY

Exchange Value Decreases 8%, to $20.75

The **Exchange Value** as of April 30, 1982 is $20.75 per pound U_3O_8. The decline of $1.75 since last month reflects the acceleration of downward trends evident last month.

Near-Term Supply Increases Sharply; Near-Term Demand Declines

Active sellers in the zero to one year time frame are offering 13.0 million pounds U_3O_8, up 1.8 million pounds from last month. Not only did supply increase, but demand was reduced as one large order was filled. *Active* uranium demand in the zero to one year time frame now amounts to only 1.4 million pounds U_3O_8. Consequently, the ratio of near-term supply to near-term demand increased sharply from 5.2:1 last month to 9.3:1 this month.

Transaction Value Decreases Eighty Cents to $22.60

The **Transaction Value** as of April 30, 1982 is $22.60 per pound U_3O_8. It includes thirteen transactions totaling 3.6 million pounds U_3O_8 and covers a period of three months.

Three Uranium Sales Reported

Three uranium sales are reported this month. The total quantity falls in the range of 0.7 million to 1.4 million pounds U_3O_8. One small sale involved a Far East buyer and an unidentified seller. The other two transactions involved US sellers and US buyers.

Conversion Value Steady at $1.20

No conversion transactions are reported. The secondary market remains quiet, but is poised for a surge of activity. Substantial additional conversion services could enter the secondary market suddenly.

Eldorado Purchases Gulf's Canadian Uranium Assets

Eldorado Nuclear announced on April 28 the execution of a memorandum of principal terms under which Eldorado will purchase from Gulf Oil all the outstanding shares of Gulf Minerals Canada, Ltd. in exchange for uranium concentrates from Eldorado's inventory. In practical terms, this means that Eldorado has traded ten to twelve million pounds U_3O_8 *(Nuexco estimate)* for Gulf's interests in the Rabit Lake mine and mill, the Collins Bay and Eagle Point orebodies and assorted other uranium properties.

Improvements in Fuel Efficiency Reviewed

Interim results of long-term efforts to improve fuel efficiency in nuclear power plants indicate that the goals of 25 percent improvement in fuel efficiency for PWRs and 35 percent for BWRs not only will be achieved, but also have a good probability of being exceeded.

Cluff Lake Project Discussed

The *Raw Materials* section continues its discussion of Canada's Cluff Lake project, owned by Amok, Ltd. and SMDC

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THE URANIUM MARKET:
WHITHER GOEST THE YELLOWCAKE ROAD

PRESENTED AT:

Atomic Industrial Forum Fuel Meeting

March 22, 1982
New York City

by

George White, Jr.
Senior Vice President
Nuexco

At the risk of stating the obvious, it must be observed that the long-term health and development of the uranium business depend on the long-term health and development of nuclear power as a source of electric generation. I make this point because there has been a tendency by many of us to pay close attention to the trees and lose sight of the forest. We focused our attention on existing uranium supply agreements. We talked about uranium demand generated by enrichment contracts, by conversion contracts and by fabrication contracts. More generally, we focused on a high uranium demand associated with a thriving nuclear industry. We believed our own optimistic forecasts, because we wanted them to be true.

We ignored the reality. Utilities were getting into financial trouble; load growth leveled out; reserve margins increased; regulatory constraints and nuclear opposition extended completion dates and nuclear plants were being canceled. We ignored all this because, as the true believers in nuclear power, we just *knew* that nuclear was the only way that made sense; we were confident that the aforementioned problems were but temporary anomalies that would soon pass as the non-believers saw the true light.

So, where are we now? We have a worldwide uranium industry that expanded vigorously to meet a market characterized by a continuing erosion of future demand. Somewhere alone the line we took our eyes off the target.

There is an imbalance between uranium production and uranium consumption. It is no secret that more uranium is being produced than is being consumed in reactors. It is true today, both for the United States and the world at large. On a worldwide basis, it will still be true in 1990. Slide Number 1 shows the world picture. Please note that we are comparing production and consumption, and we define consumption as that uranium which will be used to fabricate fuel for loading and reloading reactors. Consumption is different than demand. Demand represents the buyers' perceptions of their needs and will thus differ from consumption to the extent of those perceptions and to the extent that the buyers wish to increase or liquidate inventory. I will elaborate on this situation later.

As a natural consequence of this oversupply situation, inventories will continue to grow on a worldwide basis. Slide Number 2 compares production, consumption and inventory. Total inventories will rise from more than 400 million pounds U_3O_8 in 1982 to more than 630 million pounds U_3O_8 by 1990. These figures exclude the material owned by US DOE and other national, non-utility stockpiles.

Other Significant Factors in the Current Market

1. US production is being cut back. These cutbacks began in 1980 and continue to the present. They take a number of forms:

a. Some producers have shut down completely.

b. Some have reduced production to the level of existing contract commitments.

c. Potential new producers have deferred or canceled their plans for new facilities.

2. Non-US production is expanding; reductions in US production are being offset by new and prospective new production, primarily from Canada and Australia. Of course, even the pace of this expansion is markedly slower than had been anticipated a few years ago.

3. Non-US sellers are penetrating the US market. This displacement of higher cost US production by lower cost non-US material is a fact of life, albeit an unpleasant one for some of our US friends.

4. A number of producers have become buyers; to meet existing delivery commitments, some US producers (we can now count eleven) have found it more economical to purchase uranium than to produce it.

5. Utilities are selling uranium inventory; utilities, primarily, but not exclusively US utilities, have been active sellers of inventory during the past two years. These sales are usually for spot and near-term delivery and total more than 5 million pounds from 1980 to date.

6. Prices are down. This is a delicate area, and let me be precise in what I say. Uranium prices, as measured by Nuexco's Exchange Value, are well down from the levels reported in the late 1970s. Nuexco's Transaction Value and Nukem's quote show parallel declines — Slide Number 3 compares these three indicators from 1976 to date.

Where do we go from here? Given existing conditions and based on the aggregate data discussed earlier, the answer would appear to be "Not very far and not very fast." It's difficult to build a case for a healthy industry in such an environment. However, things are not always what they appear, and uncritical acceptance of aggregate data can be misleading. These aggregates tend to mask some unusual situations.

First among these is the breakdown of data between the United States and the rest of the world. While an earlier slide showed supply greater than consumption in every year through 1990, one sees quite a different picture when looking at the US in isolation. In Slide Number 4, we see US supply decreasing and US consumption increasing with the crossover occurring in 1983. The deficit will be made up by imports and inventory liquidation.

Moving next to the inventory situation in the United States, we find that inventory is characterized by maldistribution. Slide Number 5 shows the extremes of this maldistribution. Based on conversations with utilities and numerous surveys, the desired average uranium inventory for US utilities is about one and one half years of forward needs. However, averages and desires tell us little. A number of utilities purposefully pursue zero-inventory policies. One such utility expressed it this way:

"Why in the world should I bother to invest capital in uranium inventory when those other utilities are carrying it for me, and DOE has 130 million pounds?"

It should also be noted that the largest inventory accumulations are accidental — the result of delayed or canceled reactors or uranium supply agreements that have not been amended.

Again, using US data, I would draw your attention to some other factors. Slide Number 6 compares apparent future uranium consumption with uranium demand as perceived by the utilities themselves. Consumption is an empirically derived figure, while the demand is determined by looking at the utilities on an individual basis. Due to the natural conservatism of utility buyers and not surprisingly, demand is consistently higher than consumption. Too much, too soon may not be desirable, but too late or too little is totally unacceptable. Until reactors are officially delayed or canceled, utilities must, to be safe, plan for fuel supply on the most optimistic schedule even though such a schedule may be totally unrealistic. Most of you in this room have experience with the "official" versus "real world" situation.

Slide Number 7 is the same as Slide Number 6, but we have added existing delivery commitments. The dashed line indicates the non-US portion of such commitments.

The non-US component of US supply was added as an afterthought to demonstrate the current penetration of the US market by foreign sellers. This data is current and includes some sales not yet publicly announced. Please note that the data refers only to contracts between US utilities and non-US sellers. However, it should also be noted that additional foreign origin uranium will be delivered to US utilities by US suppliers as a consequence of litigation settlements and offshore purchases. Based on current arrangements such deliveries could total as much as an additional 35 million pounds U_3O_8 during the period 1982-1990.

The more important point of this slide is to attempt to define unfilled requirements of US utilities. By definition, unfilled requirements will be met by new purchases or inventory drawdowns. The minimum size of those unfilled requirements is defined by the difference between line C (existing commitments) and line B (forecast consumption). The maximum size is defined by the difference between lines C and A. As noted previously, we believe that actual usage and needs will approximate line B, as opposed to line A. Thus, unfilled requirements are likely to be less than suggested by reference to line A.

However, even this slide does not provide an adequate picture, for it presents the data on a gross basis which masks individual situations.

The fact that aggregate supply exceeds demand does not mean, and I repeat, *does not mean*, that there is no unfilled demand. It could and, in fact, does mean that the uranium is being supplied to people who don't need it. The true size of unfilled demand can only be developed through a company-by-company analysis.

Let me explain what I mean with a grossly simplified example. Consider the following. Total supply equals 40 million pounds. Utility demand also totals 40 million pounds, consisting of four utilities, each of which has a demand of 10 million pounds. Thus, supply and demand are in balance. Right? Wrong. Two of the utilities have purchased 10 million pounds each. The third utility has purchased 20 million pounds. The fourth has purchased nothing and still needs 10 million pounds. Thus, while supply and demand are in balance in aggregate, there is still unfilled demand of 10 million pounds.

Slide Number 8 shows the results of such a company-by-company analysis. You will note that unfilled requirements are larger and appear sooner than in the previous slide.

The conclusion I wish to draw from this brief exercise with US data is that things are never as straightforward or as simple as they may at first appear. In fact, there is considerable demand in the United States. There is also unfilled demand overseas, though proportionately less due to the propensity of non-US buyers to carry larger inventories and contract further into the future.

Given all the foregoing, what can we expect to see during the remainder of this year and the foreseeable future?

Utilities

US utilities will be entering the market to purchase intermediate and longer term needs. Since late 1981, a number of public invitations have appeared and more are likely. By mid-year, we would expect the total to exceed ten. It is also interesting to note that some US utilities have elected to forego the public invitation route and have, instead, opted to use the negotiated approach. We would not be surprised to see increased use of the negotiated approach, for the results appear at least equal and probably superior, to those achieved through competitive invitations.

Most US utilities continue to resist entering longer term contracts which contain pricing provisions that can operate in such a manner so as to cause them to pay more than spot prices for any considerable period of time.

This provides problems for higher cost producers who cannot afford the risk of guaranteeing delivery at spot prices. As a consequence, a number of recent contracts contaiin so-called "walk-away" provisions designed to protect buyer or seller depending on whether spot prices are too high or too low. We anticipate more such contracting.

US utilities will buy increasing quantities from non-US producers, and non-US supply could account for as much as sixty percent of deliveries to US utilities by 1990. Despite expressed concern about the viability of the US uranium production industry, US utilities are, in the main, extremely price sensitive. The entire public utility fabric is aimed at providing service at the lowest possible cost to the consumer. It is difficult to visualize a general consensus to pay substantially more for US origin uranium. However, the decision is unlikely to be that clear cut, due to differing times of market entry, current availability, size and other factors. Furthermore, as you know, some few US utilities will insist that all or some major portion of this supply be of US origin. So, to paraphrase Mark Twain, "Reports of the death of the US uranium industry are greatly exaggerated."

Utility inventory sales will continue. While US utilities will be particularly prominent, they will have competition from non-US inventory sellers. High interest rates and faltering reactor programs are the prime motivators of such sales. It is important to recognize that once a user decides to liquidate inventory, price becomes a secondary consideration. In this regard, we must take note of another factor. As spot prices fell during 1980 and 1981, various utilities withdrew as sellers. It can be anticipated, therefore, that new utility selling pressure would be triggered by any price strengthening.

Another aspect of such inventory sales should be especially noted. Increasing quantities of inventory will be in the form of natural and enriched UF_6. Transactions will become increasingly complex, requiring, in many cases, de-enrichment and de-conversion into component parts prior to sale. Excesses of conversion and enrichment services parallel the market overhang that exists in uranium. The development of discount markets in conversion and enrichment services attest to this condition.

US Producers

US producers find themselves in a difficult position. Most US production costs are now in excess of current spot price levels. As existing contracts run out, US sellers are finding it difficult to offer terms that make economic sense for them and are, at the same time, acceptable to US utilities. US producers have reacted to this situation differently, but three general patterns have emerged.

1. Close down production and buy in scheduled deliveries.
2. Cut back production to the level of existing delivery commitments.
3. Contract forward on a basis that allows a walk-away if prices don't recover.

The choice of strategy depends on two factors: first, production costs, and second, the level of prices being received under existing contracts.

The buying-in strategy has two benefits. On the one hand, it restricts supply and, on the other, because most such buy-in purchases are made from utilities inventory sellers, it assists in redistributing the utility inventory.

I would offer one final observation in this regard. Uranium users worldwide prize diversity of supply. Ignoring for the moment the attitude of US utilities and the US government, the *complete* demise of the US uranium industry would be a matter of concern to *non-US* buyers, for they would be thrust into competition with US buyers for available suppliers from other world sources. The Australian experience has shown that premium prices will be paid for diversity. Cogema's pending purchase of Pathfinder is another manifestation of this tendency.

Non-US Producers

As noted earlier, we anticipate continued and increasing penetration of the US market by non-US producers. The Canadians with their high-grade Saskatchewan deposits are currently the principal and most aggressive long-term sellers in the world market.

Australia is somewhat puzzling. Timely entry was hampered by political events. Once viewed as essential, Australian production is now seen as an interesting alternative, particularly to those buyers intent on diversifying sources of supply. This factor, diversity, accounts for the sales made during the past few years at prices and under terms and conditions not otherwise competitive. Due to the Australian government's announced floor price policy, further sales appear foreclosed at this time. However, the government remains committed to the long-term expansion of the Australian uranium industry. And furthermore, any realistic hope of developing a viable enrichment industry in that country must include increased uranium production. Consequently, it is my personal opinion that Australia will, in time, alter its floor price policy in such a manner as to allow new sales without jeopardizing its existing contracts.

In South Africa, as you know, most uranium is

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produced as a by-product of gold mining operation and is sold through NUFCOR. As you probably also realize, much less is known about NUFCOR's customers and contracts than other major suppliers. This is, of course, exactly the way the South Africans want it. We do know that most contracts are long term, that many provided for prepayments and that production costs are generally low. While uranium profits are down from 1979 and 1980 levels, and some new uranium production operations may be uneconomic, South Africa is well placed to weather the current market weakness.

Namibia, Niger, and Gabon are similarly situated. While production costs are higher, long-term contracts insure the take-off of production. Any hopes to expand must, however, await an improved market and, in Namibia's case, resolution of current political uncertainties.

Prices

As regards prices, I have no forecasts for you. I would, however, offer these observations based on the realities of supply, demand, consumption and inventory.

The existence of a large and growing inventory overhang and the willingness of inventory holders to sell suggest continued pressure on spot price levels.

However, even current spot price levels are below the production costs of all but the highest grade producers. Thus, buyers seeking to purchase in the intermediate and long term are apt to be seeing offers which bear little resemblance to the spot market. It is possible that a substantial anomaly may develop between spot prices and prices offered under new long-term contracts. Our overseas friends, buyers and sellers alike, have often noted over the past years that we, in the United States, did not appreciate the difference between the spot and longer term market. Perhaps they are correct.

If US utilities are serious about contracting for firm supply in the longer term, they will have to abandon their procurement philosophy of spot market pricing in such contracts. They will have to accept the more conventional pricing approaches. By conventional, I refer to such familiar approaches as:

1. Cost plus;
2. Base price plus escalation;
3. Higher of floor price or market price.

If, on the other hand, these approaches are unacceptable and price remains paramount, two other developments are likely to follow:

1. First, some utilities will decline to contract at this time and rely instead on spot market.

2. Second, if the difference between the spot price and long-term offers exceeds the cost of money, we could see a reappearance of the early procurement strategy that emerged in the early 1970s. If taking delivery and paying *today* for use in 1986 is substantially cheaper than would be the case for contracting today for delivery and payment in 1986, then, to the extent that cash is available, we could expect to see such early procurement.

As a final note regarding prices, I must address the embargo question, for its reimposition at a low level would impact on prices, not right away, certainly, but in time. We have commented on this subject publicly in the past, and I will only reiterate those views, for they have not changed. They are as follows:

1. For a variety of reasons, mostly political in nature, we do *not* believe that a meaningful embargo on the use of foreign origin U_3O_8 will be enacted.

2. We do not believe that imports of foreign U_3O_8 represent a strategic threat to the US. We cannot be "OPECed" in uranium.

In conclusion, for better or worse and whether you like it or not, and despite government interventions and apparently unending litigation, the market system is working. Price remains the final arbiter.

Table 1

FREE WORLD URANIUM PRODUCTION vs CONSUMPTION
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION	106.3	104.7	106.0	102.2	106.3	108.9	112.6	113.7	115.3
CONSUMPTION*	56.5	75.2	76.6	81.1	92.1	92.9	99.0	99.4	96.4

*Nuexco's Apparent Future Consumption Reference Case

Table 2

FREE WORLD URANIUM SUPPLY/DEMAND BALANCE
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION	106.3	104.7	106.0	102.2	106.3	108.9	112.6	113.7	115.3
less									
CONSUMPTION[1]	56.5	75.2	76.6	81.1	92.1	92.9	99.0	99.4	96.4
equals									
NET INVENTORY INCREASE	49.8	29.5	29.4	21.1	14.2	16.0	13.6	14.3	18.9
plus									
BEGINNING INVENTORY[2]	426.1	475.9	505.4	534.8	555.9	570.1	586.1	599.7	614.0
equals									
ENDING INVENTORY	475.9	505.4	534.8	555.9	570.1	586.1	599.7	614.0	632.9

[1] Nuexco's Apparent Future Consumption Reference Case

[2] Nuexco estimate 1982 Beginning Inventory

Table 3
COMPARISON OF NUEXCO AND NUKEM HISTORICAL E.V. & T.V.
(US Dollars/lb. U_3O_8)

	1976			1977		
	E.V.	T.V.	Nukem	E.V.	T.V.	Nukem
Jan	35.20	—	—	41.35	41.30	—
Feb	37.00	—	—	41.50	41.30	—
Mar	39.25	—	—	41.60	41.40	—
Apr	40.00	—	—	41.60	41.50	—
May	40.00	39.60	—	42.00	42.80	—
Jun	40.00	39.70	—	42.25	42.90	—
Jul	40.00	39.70	—	42.25	43.00	—
Aug	40.40	40.40	—	42.25	42.60	—
Sep	41.00	40.30	—	42.40	42.50	—
Oct	41.00	40.60	—	42.75	42.80	—
Nov	41.50	40.70	—	43.20	42.90	—
Dec	41.00	40.70	—	43.20	42.90	—

	1978			1979		
	E.V.	T.V.	Nukem	E.V.	T.V.	Nukem
Jan	42.90	43.10	42.00-45.00	43.25	43.60	42.20-43.50
Feb	43.25	43.30	42.00-45.00	43.25	43.80	42.50-43.50
Mar	43.25	43.70	43.00-45.00	43.25	43.70	42.50-43.50
Apr	43.25	43.60	43.00-45.00	43.25	43.40	42.50-43.50
May	43.40	43.60	43.50-45.00	43.25	43.60	42.50-43.50
Jun	43.40	43.20	43.50-45.00	43.00	43.70	42.50-43.25
Jul	43.40	43.30	43.40-44.50	42.70	43.70	42.50-43.25
Aug	43.10	43.40	43.00-44.20	42.70	43.60	42.50-43.25
Sep	43.25	43.40	43.00-44.20	42.20	43.60	42.50-43.25
Oct	43.00	43.60	43.00-44.20	42.20	43.60	41.50-42.50
Nov	43.25	43.40	42.45-44.00	41.00	43.50	41.00-42.00
Dec	43.25	43.70	42.20-43.50	40.75	42.30	41.00-42.00

	1980			1981		
	E.V.	T.V.	Nukem	E.V.	T.V.	Nukem
Jan	40.00	42.00	38.00-40.00	25.00	27.20	27.00-28.00
Feb	38.00	39.30	38.00-40.00	25.00	27.20	25.00-27.50
Mar	35.00	38.60	37.00-38.00	25.00	27.00	24.40-26.00
Apr	32.00	38.40	31.50-35.00	25.00	25.70	24.40-26.00
May	32.00	37.90	30.50-32.00	25.00	25.70	24.40-26.00
Jun	31.50	37.60	30.50-32.00	24.25	24.50	24.40-26.00
Jul	31.50	37.30	30.50-32.00	23.50	24.40	23.90-26.00
Aug	30.00	31.60	30.50-32.00	23.50	24.30	23.50-25.50
Sep	28.50	30.60	30.50-32.00	23.50	23.90	23.50-25.50
Oct	28.00	29.00	29.00-30.00	23.50	24.10	23.50-25.50
Nov	28.00	28.70	28.50-29.50	23.50	24.10	23.25-24.60
Dec	27.00	27.70	27.75-28.50	23.50	24.00	23.25-24.60

	1982		
	E.V.	T.V.	Nukem
Jan	23.00	24.00	23.25-24.60
Feb	23.00	23.70	—

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Table 4

UNITED STATES URANIUM PRODUCTION vs CONSUMPTION
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
PRODUCTION	26.8	21.0	19.0	17.6	18.1	18.1	18.0	16.7	15.2
CONSUMPTION[1]	21.3	28.2	28.5	31.4	36.0	35.6	37.1	38.2	37.7

[1] Nuexco's Apparent Future Consumption Reference Case

Table 5

DISTRIBUTION OF RELATIVE INVENTORY LEVELS OF US UTILITIES

Years of Forward Consumption in Inventory as of End of 1981	Number of Utilities
0 - 1	12
1 - 2	16
2 - 3	11
3 - 4	2
4 - 5	5
5 - 6	3
> 6	3

Table 6

UNITED STATES URANIUM CONSUMPTION vs DEMAND
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
CONSUMPTION[1]	21.3	28.2	28.5	31.4	36.0	35.6	37.1	38.2	37.7
DEMAND[2]	34.0	37.9	46.4	46.0	47.8	50.4	50.4	53.5	51.4

[1] Nuexco's Apparent Future Consumption Reference Case

[2] Nuexco's estimate of the buyers' stated, or otherwise indicated, willingness to buy uranium now or at some time in the future.

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Table 7

URANIUM SUPPLIES and US DEMAND
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
US Consumption[1]	21.3	28.2	28.5	31.4	36.0	35.6	37.1	38.2	37.7
US Demand[2]	34.0	37.9	46.4	46.0	47.8	50.4	50.4	53.5	51.4
US Utility Supplies	29.6	26.3	25.7	24.5	20.7	17.2	18.3	15.0	12.3
US Utility Imports	5.5	5.4	6.6	3.9	4.1	3.2	3.4	3.4	3.4

[1] Nuexco's Apparent Future Consumption Reference Case

[2] Nuexco's estimate of the buyers' stated, or otherwise indicated, willingness to buy uranium now or at some time in the future.

Table 8

US UTILITIES UNFILLED URANIUM DEMAND/CONSUMPTION
(millions of pounds U_3O_8)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Individual Utility Unfilled Demand	2.5	5.6	6.8	11.9	15.8	24.6	26.7	34.3	36.4
Aggregate Unfilled Consumption	0	1.9	2.8	6.9	15.3	18.4	18.8	23.2	25.4

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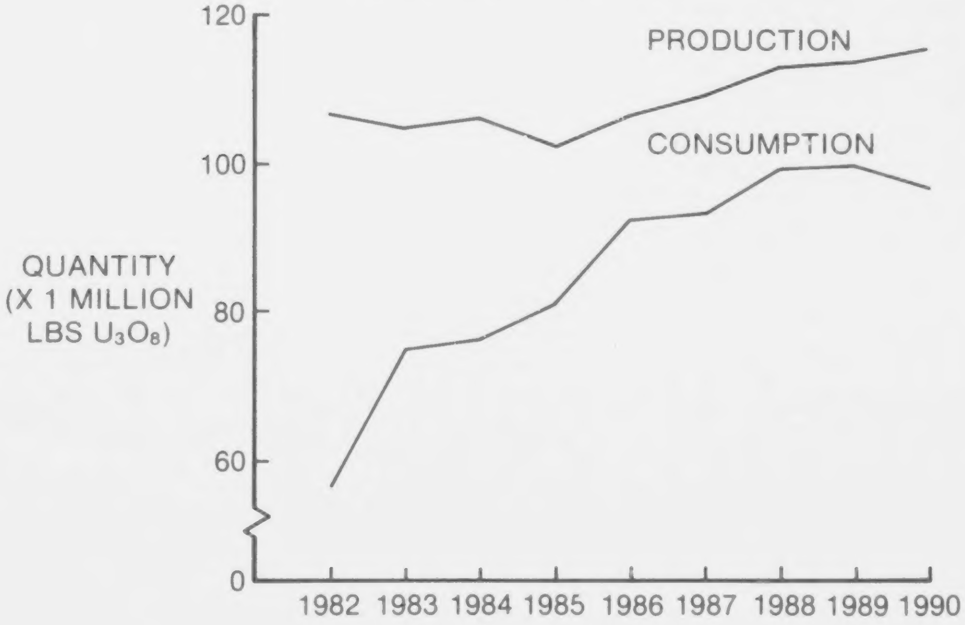
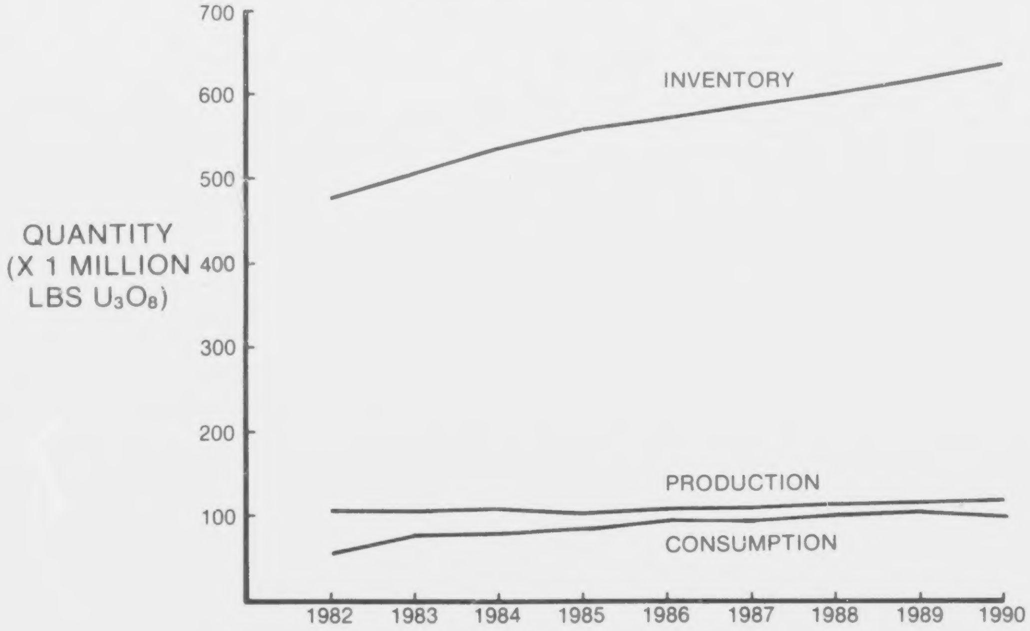
SLIDE 1: FREE WORLD URANIUM PRODUCTION VS. CONSUMPTION



SLIDE 2: WORLD PRODUCTION, CONSUMPTION AND INVENTORY



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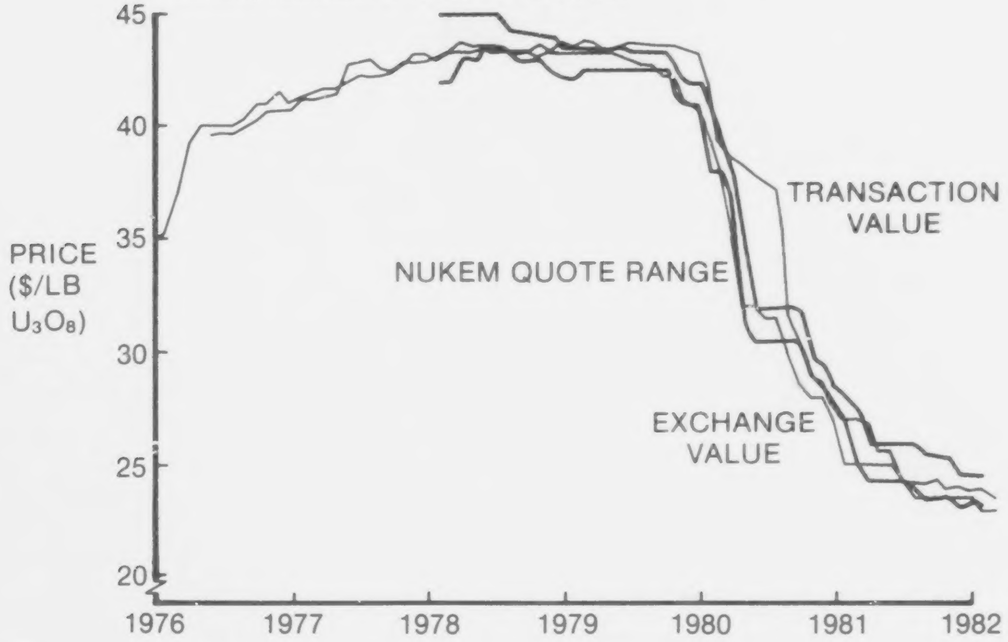
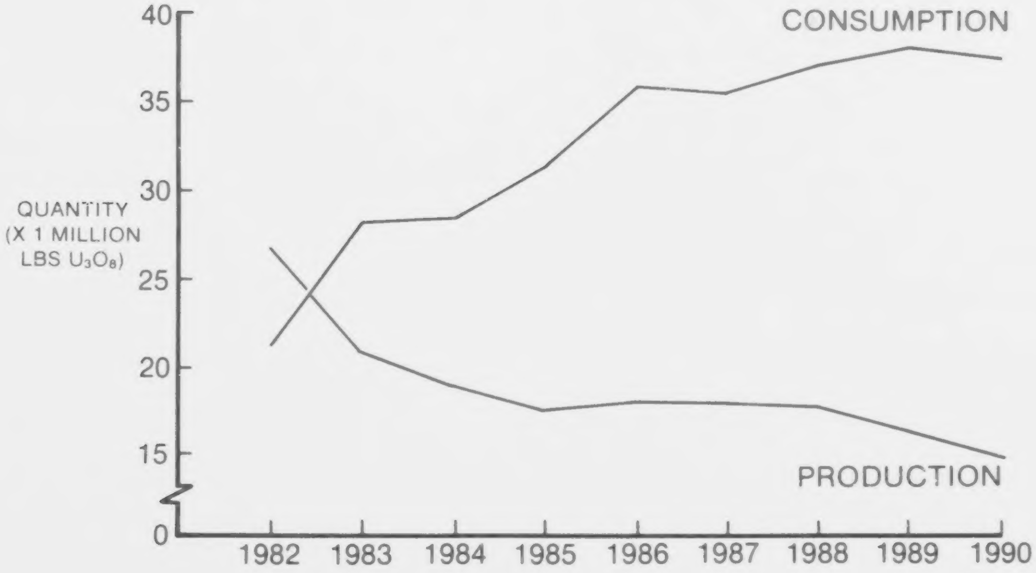
SLIDE 3: NUEXCO'S EXCHANGE AND TRANSACTION VALUES; NUKEM'S QUOTE RANGE



SLIDE 4: U.S. PRODUCTION VS. CONSUMPTION



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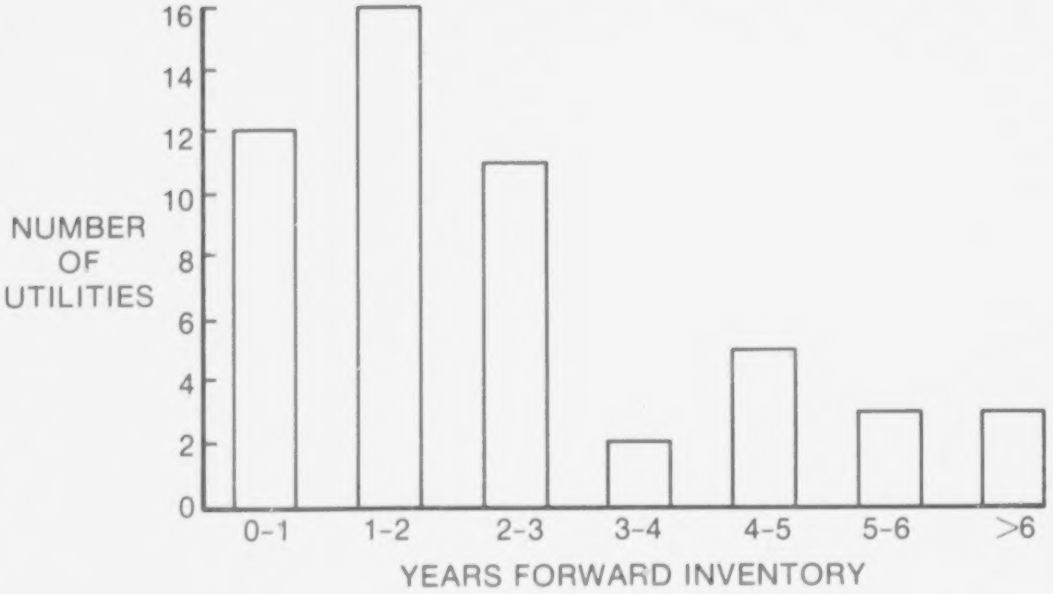
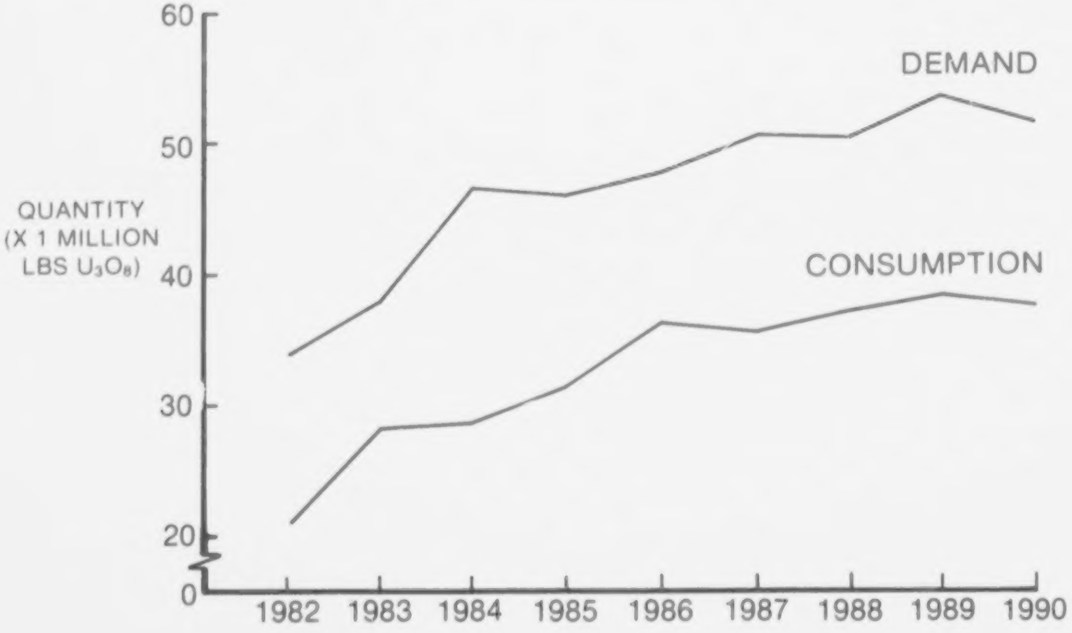
SLIDE 5: U.S. UTILITY INVENTORY DISTRIBUTION



SLIDE 6: U.S. CONSUMPTION VS. DEMAND



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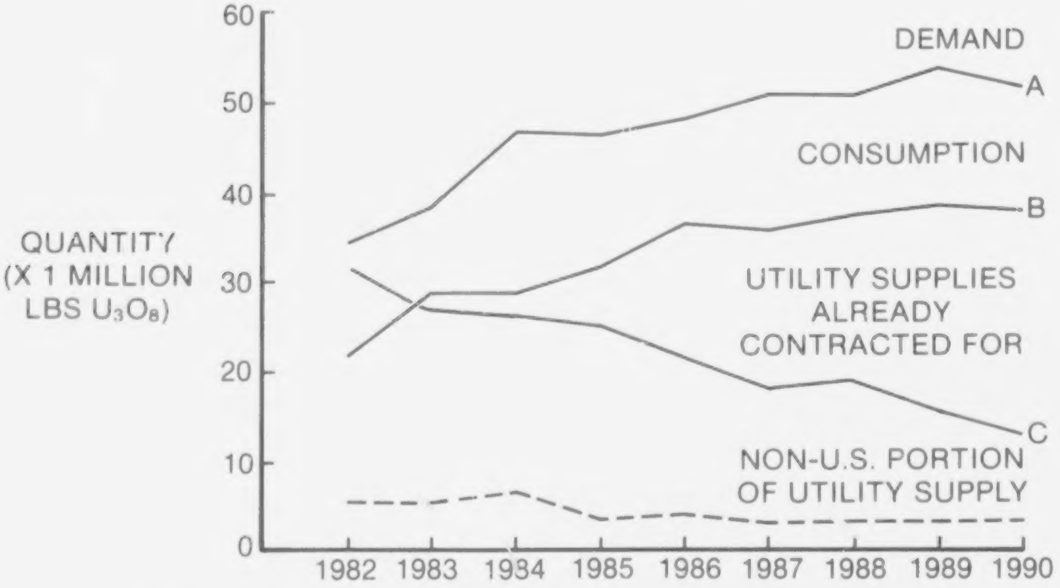
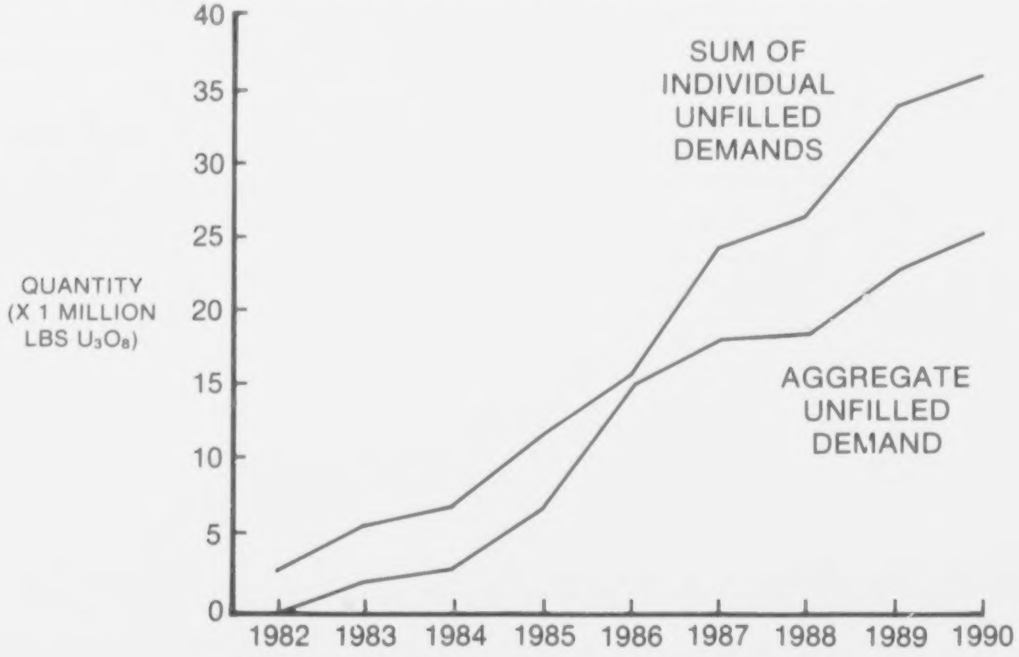
SLIDE 7: U.S. CONSUMPTION, U.S. DEMAND, U.S. UTILITY SUPPLY ALREADY CONTRACTED FOR



SLIDE 8: AGGREGATE U.S. UNFILLED DEMAND VS. SUM OF INDIVIDUAL U.S. UTILITY UNFILLED DEMANDS



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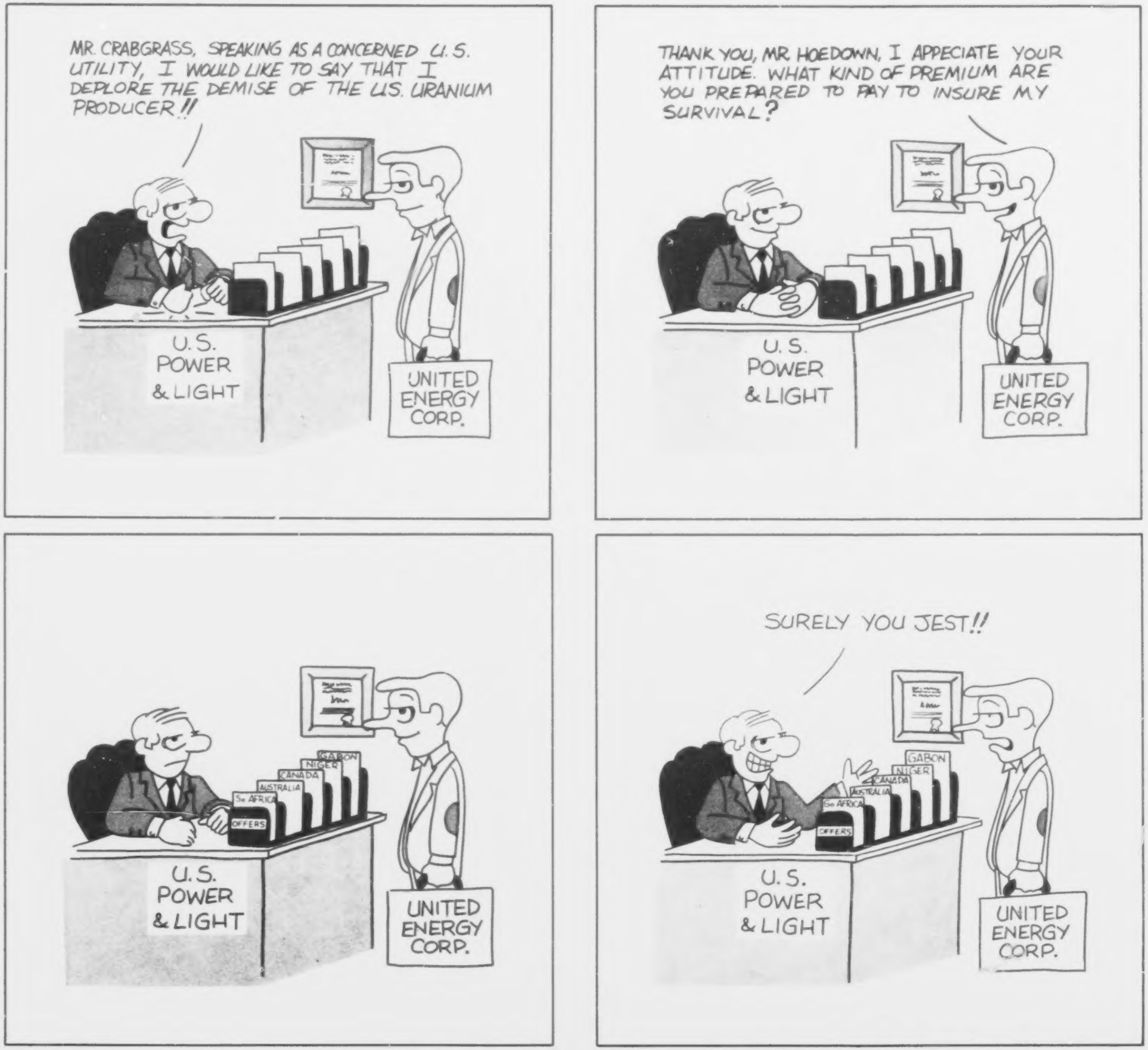
MR. CRABGRASS, SPEAKING AS A CONCERNED U.S. UTILITY, I WOULD LIKE TO SAY THAT I DEPLORE THE DEMISE OF THE U.S. URANIUM PRODUCER!!
U.S. POWER & LIGHT
UNITED ENERGY CORP.
THANK YOU, MR. HOEDOWN, I APPECIATE YOUR ATTITUDE. WHAT KIND OF PREMIUM ARE YOU PREPARED TO PAY TO INSURE MY SURVIVAL?
U.S. POWER & LIGHT
UNITED ENERGY CORP.
OFFERS
So AFRICA
AUSTRALIA
CANADA
NIGER
GABON
U.S. POWER & LIGHT
UNITED ENERGY CORP.
SURELY YOU JEST!!
OFFERS
So AFRICA
AUSTRALIA
CANADA
NIGER
GABON
U.S. POWER & LIGHT
UNITED ENERGY CORP.

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NUEXCO

MONTHLY REPORT ON THE URANIUM MARKET

June 1982 No. 166

R. WESLEY MILLER, *EDITOR*

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NOTICE

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FOREWORD

We are pleased to announce that Kenneth R. McCue has joined Nuexco and has been elected a Vice President. Ken will be based in Nuexco's New York office, but during the next few months will be spending part of his time in Nuexco's headquarters in Menlo Park, California.

Ken is a nuclear engineer holding a Bachelor's degree from Texas A&M and Master's and Ph.D. degrees from Purdue University. From 1973 to 1979 he was employed by Stone & Webster Management Consultants, Inc. More recently he was associated with Transnuclear, where he was Manager of Fuel Cycle Services.

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of May 31, 1982 is $20.50 per pound U_3O_8, down $0.25 from last month's level of $20.75.

While this month's decrease of about one percent is modest when compared to April's decline of nearly eight percent, it marks the end of the third year of steady decline. Although there have been brief periods of stability, the Exchange Value has not increased once during the past 36 months.

Active sellers in the zero to one year time frame are offering 15.2 million pounds U_3O_8, up 2.2 million pounds from last month. Active uranium demand in the same time frame increased slightly, to only 1.6 million pounds U_3O_8. Consequently, the ratio of near-term supply to near-term demand increased slightly, from 9.3:1 last month to 9.5:1 this month. However, as much as five million pounds of additional U_3O_8 could become available at almost any time.

* * *

The **Transaction Value** as of May 31, 1982 is $22.70 per pound U_3O_8, an increase of $0.10 from April. May's Transaction Value includes 15 transactions totaling 4.0 million pounds U_3O_8 and covers a period of four months. Accounting for the slight increase are two transactions negotiated at higher prices some months ago, but only recently signed.

1. A US producer purchased 101,000 to 300,000 pounds U_3O_8 for 1982 delivery. The seller was another US producer.
2. A US producer purchased 101,000 to 300,000 pounds U_3O_8 for 1982 delivery. The seller was another US producer.

* * *

The **Conversion Value** as of May 31, 1982 is $1.00 per pound U as UF_6, down $0.20 from last month. As anticipated for the past two months, substantial additional conversion services entered the secondary market during May. The result is a dramatic oversupply in the secondary conversion market similar to that of the uranium market. Active sellers are offering 4.9 million pounds U in near-term conversion services, while active demand in the same time frame amounts to only one-seventh that amount, 700 thousand pounds U.

One conversion transaction is reported. One US utility sold another US utility conversion services for 301-600 thousand pounds U for 1982 delivery.

* * *

The **Loan Use Charge Rate** remained at six percent. At least one and possibly more loan transactions are under discussion at that general level.

AUSTRALIA

Three months before the completion of the final feasibility study for the Yeelirrie project, owned by Western Mining Corp. (WMC) (75 percent), Esso Exploration and Production Australia Inc. (15 percent) and Urangesellschaft Australia Pty. Ltd. (UGA) (10 percent), Esso announced its withdrawal from the joint venture. Esso stated that its continued involvement in the project was no longer economically justified. The 1978 uranium joint venture agreement provided that Esso, apart from its 15 percent equity share, would fund a further 35 percent of the capital costs in the form of a pre-payment and would receive an additional 35 percent of the uranium production, forecast to be 5.9 million pounds U_3O_8 annually. Esso would thus have taken half of the projected annual output and funded half of the estimated A$350 million initial outlay for the project.

Esso's withdrawal from Yeelirrie is consistent with the policy of its US parent, Exxon Corp., which is in the process of reducing its involvement in worldwide uranium ventures as well as its participation in other energy projects. The company recently announced its withdrawal from the Colony joint-venture oil-shale recovery project. There have been rumors also that Exxon is looking to extricate itself from the Midwest Lake uranium project in Canada, held by its Canadian affiliate Imperial Oil.

Esso's departure disengages the project's parties from an agreement that was advantageous for WMC, having been concluded during a period of more buoyant market conditions. It is unlikely that WMC will be able to negotiate the same terms today. However, the company is publicly optimistic that the venture will be satisfactorily restructured. To meet WMC's original timetable, a new partner would have to be found by February of 1983. The minority partner, UGA, is regarded as a potential taker of the Esso position.

Despite WMC's apparent optimism, it is clear that Esso's move is a setback in Yeelirrie's development.

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Although the project's production costs are claimed to be competitive in today's market, the overriding factors are market conditions and the price at which the Australian government would allow project sales. Those factors combine to make this an unfavorable time in which to seek financing partners. Also, it is possible that Esso's unwillingness to continue project expenditures will cause second thoughts for potential partners.

The Esso move has significant implications for other would-be producers in Australia. It creates a more objective perspective of the uranium market for managements whose market assessment may be colored by their own desires to get into production as early as possible. Exxon's withdrawal also reemphasizes that the US market is not a practical outlet for Australian production in the near to mid-term. Finally, the competition for market share will be affected, particularly for the Jabiluka and Lake Way projects, both of which recently received government approval to begin marketing future output.

Under Australian foreign investment guidelines, a uranium project cannot contain more than 25 percent foreign equity. In the past, long-term buyers from Europe and the Far East have tied uranium purchases to equity holdings. Until Esso's withdrawal, only the small Lake Way project (100 percent Australian owned by CSR through its subsidiary Delhi Petroleum) could have offered any equity as incentive to potential buyers. Now, however, a new option is available to European and Far East buyers who still wish to acquire a stake in Australian uranium. A buyer interested in an equity position in Australia could be in a very favorable position to negotiate a good deal by encouraging competition between the various projects.

As viewed by WM, however, the company's ability to offer an equity position will aid the sale of production and thus give Yeelirrie an edge over Jabiluka and other projects in competing for the limited market share. In this light, Esso could be thought to have done WM a favor by allowing them to get closer to potential customers with the new attractive offering.

* * *

The Australian Council of Trade Unions (ACTU) has changed the implementation method of its uranium policy. The ACTU executive group has adopted a working party report calling for a re-emphasis of the policy towards public and union awareness of the issue. Instead of directly opposing uranium mining and export, the group will engage in an information and education campaign supported by money from voluntary contributions by affiliated unions. The executive group also called on affiliated unions to institute a voluntary fund to support unionists who decide to oppose uranium mining by industrial action.

Since the Council's adoption of the hardline, anti-uranium policy in 1977, successful implementation has been very difficult. More than 100 shipments totalling 14 million pounds U_3O_8 have been exported from Australia and two new mines have been brought into production with a combined annual capacity of ten million pounds U_3O_8. ACTU's failure to implement the anti-uranium policy is tied to the fact that it lacks the power to prevent its members from working in uranium mines.

* * *

Legal opinions from practicing and academic lawyers have assured the Federal Executive of the Australian Labor Party (ALP) that implementation of its anti-uranium policy would not have compensation risks in the event that an Australian Labor government were elected. A future Australian Labor government *would* have the constitutional powers to implement the ALP policy to repudiate uranium contracts without fear of being liable for compensation to mining companies, according to the legal sources.

* * *

Australia has made its position on the impending US uranium import legislation known at various levels of the US government and has threatened to mount a challenge under the General Agreement on Tariffs and Trade (GATT) if the US Congress passes the legislation which is now in conference committee. The Australian diplomatic note says that the Australian government will reserve its rights under the GATT if the bill becomes law.

EUROPE

European reaction to the threat of a US embargo on uranium imports has been quite negative. The governments of **France** and **West Germany** have followed those of Canada and Australia by officially protesting the embargo proposed by Senator Domenici. At the same time, the Uranium Institute has written to the Congressional conference committee to express its concern over the issue.

The prevailing view in Europe seems to be that:

1. Previous protectionist actions by the US government and the antitrust litigation of recent years have

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contributed heavily to the instability of the world market for uranium.

2. With its high capital costs and long lead times, the nuclear power business is having difficulty adjusting to cutbacks in nuclear power programs.

3. A new protectionist action by the US would aggravate the already unstable conditions facing the market.

The essence of Europeans' objections to the proposed embargo is economic. They simply do not want the US removed as a potential market, since it represents one-third to one-half of total uranium consumption for this decade. US uranium imports, however, have been limited by numerous factors, among them the following:

1. The US utilities' customary preference for US supply.

2. The original US embargo.

3. The antitrust investigations into the activities of uranium producers.

In recent years, attempts to sell into the US market have been hampered by large inventories and falling demand. Of late, however, foreign producers have been training their sights on the US market of the late 1980s. As high-cost US producers have cut back or withdrawn from the business altogether, foreign producers have begun to anticipate supplying as much as fifty percent of US needs by the latter part of this decade. If they succeed, US uranium imports would constitute twenty percent of world uranium consumption, but those imports represent a much larger share of the presently unfilled demand for that time frame.

It has been suggested that perhaps foreign producers would benefit from the imposition of a US embargo on uranium imports. The reasoning proceeds as follows:

1. A US import embargo would force US utilities to buy from US suppliers.

2. US demand would exceed US supply and spot prices would rise.

3. Spot prices would have to rise to more than $40 per pound U_3O_8 in order to stimulate enough US production to meet US demand.

4. Low US spot prices have been exerting downward pressure on negotiated prices for deliveries to non-US destinations. That pressure would stop and non-US producers would be able to negotiate more favorable prices for future deliveries.

That line of reasoning is rejected by most producers, who maintain that average delivery prices under long-term contracts in the US are still above $30 per pound and are not that far out of line with prices elsewhere. Countries like France, which are not net exporters of uranium and so would not stand to lose directly, maintain that all they want is a free world market for uranium and that the industry as a whole would suffer from protectionist policies.

There is a widespread belief that it would be the US itself which would suffer in the long run from an import embargo. By the latter part of this decade, the US could be vulnerable to retaliatory actions by governments of uranium producing nations. Furthermore, a uranium import embargo by the US could trigger retaliation by Canada, from whom the US imports large amounts of natural gas. Finally, protectionist actions by the US in support of its uranium industry would weaken US arguments in favor of free trade in other areas.

* * *

In **Spain**, the director of the Lemoniz nuclear power project, Sr. Angel Pascual Mugica, was assassinated on May 5, probably by ETA, the Basque terrorist group. The murder occurred just hours before the Basque government was to sign an agreement creating a government-controlled regional energy corporation. As mentioned in Nuexco Report 164, the corporation would have taken over operational control for the Lemoniz project from Iberduero.

After the murder, nearly 100 key Iberduero employees left their jobs on the Lemoniz project. In order to recruit a new engineering staff to complete work on the project, Iberduero has declared a three-month moratorium on construction at Lemoniz. The newly hired workers will resume work under maximum security conditions.

Despite this latest in a series of terrorist attacks aimed at the Lemoniz project, both Iberduero and the central government reaffirmed their commitment to the completion of the project.

* * *

On May 12 the CEGB published its "Statement of Case" to the **United Kingdom** government for its Sizewell B project. It argues for a nuclear power station of 1110 MWe based on the Westinghouse PWR and which it hopes to start building in 1984 for completion in 1991.

The CEGB document attempted to anticipate all the arguments which objectors will put forward at the public inquiry scheduled to open in January 1983. Apart from the safety case, much space has been dedicated to

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proving why construction should begin now.

Sizewell B will come onstream at a time when many older plants will be closing down (there is now in existence six percent of surplus capacity). The board believes that it is too dependent on expensive coal and stresses the need for fuel diversity.

So far there has been little response from objectors, perhaps because they have been stunned by the detail and abundance of the evidence. Mr. Fred Bonner, who describes himself as "acting chairman, unpaid" of the CEGB, believes that the future of civil nuclear power in Britain is at stake.

* * *

Dr. Walter Marshall, Chairman of the UKAEA, has been appointed the new Chairman of the CEGB, effective July 1, 1982. The appointment of this eminent figure signals the government's commitment to a continuing nuclear power program. Dr. Marshall, when Chief Scientist at the DOE, was sacked by the Labor Minister, Mr. Tony Benn, in 1977 for being too strong an advocate of nuclear power. Last summer Dr. Marshall was made Chairman of the task force which was created to give impetus to the PWR choice of reactor.

* * *

FAR EAST

Recent marketing trips to **Japan** by uranium producers from Australia and other nations have met with little success, if any. Japanese enthusiasm for new, large, long-term commitments has waned as prices have continued to soften, and it has become increasingly clear that nuclear growth rates will fall short of optimistic planning targets. Even the chance to acquire equity participation in new production ventures failed to provide the incentive anticipated by would-be producers.

Existing supply agreements are such that uranium is being delivered at rates well in excess of actual and likely future consumption. Consequently, some Japanese buyers are exercising contractual rights to reduce delivery quantities so as to minimize inventory build-up. Given such conditions, additional contracting is unlikely unless the sellers can offer substantial flexibility in areas of pricing and quantities. These areas are, of course, precisely those that are most difficult for producers attempting to base load new facilities. Lacking firm delivery schedules and prices, financing for large-scale new projects will be difficult, if not impossible, to obtain.

* * *

Taiwan's nuclear power program is administered by the government-owned utility, Taiwan Power Company (Taipower), and includes three units in operation, two under construction, and a sixth scheduled for startup in late 1982 as follows:

Unit	Type	MWe	Status
Chin-shan 1	BWR	604	Operational since 12/78
Chin-shan 2	BWR	604	Operational since 9/79
Kuosheng 1	BWR	951	Operational since 12/81
Kuosheng 2	BWR	951	Operation scheduled 12/82
Maanshan 1	PWR	907	Operation scheduled 4/84
Maanshan 2	PWR	907	Operation scheduled 4/85

Fuel loading for Kuosheng Unit 2 took place in March of this year as scheduled. As of April 3, 1982, Maanshan Unit 1 was 61.24 percent complete and Unit 2 was 36.6 percent complete. Construction on the two units appears to be moving well towards the estimated operational dates.

Six more units, representing 6,600 MWe, are planned for operation by the year 2000. The first two of these additional units are scheduled for operation in 1991 and 1992, and discussions with NSSS suppliers with respect to these two units are currently under way. A substantial portion of the financing for Taipower's nuclear program has come from the Export-Import Bank, so the US has historically had a preferred supplier position.

During 1981, nuclear power provided about 25 percent of the electric power generated in Taiwan; the balance was supplied by oil (52 percent), coal (11 percent), and hydro (12 percent). The availability factors for Chin-shan Units 1 and 2 during 1981 were 95.57 and 85.94 percent, respectively. In 1981, however, for the first time in its history, Taipower did not experience any load growth. In fact, generation was 1.32 percent below 1980 levels. Taipower's development program was revised accordingly, but since uranium is Taiwan's cheapest energy source, nuclear plans were not affected.

Taiwan lacks indigenous sources of uranium and political circumstances dictate that uranium may only be purchased from South Africa and the US. Taipower has, however, built up substantial uranium inventories, including some in the form of finished fuel. The presence of inventories means that Taipower will not be required

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to make new purchases until the middle of this decade. Naturally, a particularly attractive opportunity might induce Taipower to add to inventories before that time. Taipower is involved in only one uranium exploration program — a joint venture with another utility in Paraguay.

Taipower holds contracts with US DOE to cover all its present enrichment needs. The company has no plans for reprocessing and spent fuel is being stored at the respective plants in expanded capacity high-density racks.

UNITED STATES

The month of May produced some good news for the US nuclear utilities, but the good was outweighed by the bad.

On the negative side, the Nuclear Regulatory Commission (NRC) ordered Southern California Edison to indefinitely close its San Onofre Unit 1 which began operation in 1968. The closure is to permit an NRC study of design modifications necessary to meet earthquake safety standards.

* * *

The NRC staff was prepared to issue a fuel loading and low power license this month to South Carolina Electric and Gas for its Summer unit, but petitions have been presented to reopen ASLB hearings because of the steam generator. It is a Westinghouse D3 model which has been having vibration problems leading to tube thinning in operating reactors where it is used.

* * *

Two utilities announced delays in projected operating dates for nuclear reactors now under construction. Illinois Power has delayed its Clinton Unit 1 startup by one year, from 1984 to 1985. The Washington Public Power Supply System (WPPSS) reluctantly accepted the advice of the Bonneville Power Administration (BPA) and delayed for up to five years WNP Unit 1 (50 percent complete).

* * *

The Massachusetts Public Utilities Commission reported that, in its opinion, Boston Edison waited a year longer than it should have to cancel Pilgrim 2. The PUC approved the utility's request to recover from its customers its loss from the unit's cancellation, but the granted amount, $327.6 million over the next thirteen years, was substantially less than requested. Boston Edison has questioned the basis for calculating the amount to be recovered and is considering challenging the decision.

* * *

Puget Sound Power and Light has asked state and federal agencies to delay processing its applications to build two nuclear units at Hanford, Washington. Despite the request, the utility, the chief sponsor of the plant in partnership with three other utilities, has indicated it is not abandoning its plans to build the units.

* * *

The Pennsylvania Public Utilities Commission directed Philadelphia Electric to discontinue work on Limerick 2, which is 30 percent complete, and declared it intends to deny approval of any public offering to raise funds specifically for the unit. The utility reiterated its belief in its future need for power from Limerick 1 and 2 and is studying, among other options, whether to appeal in state courts, suspend construction for three years or cancel Limerick Unit 2.

* * *

Local voters in the vicinity of the Three Mile Island (TMI) nuclear plant voted more than 2 to 1 for a nonbinding referendum against the restart of the undamaged TMI Unit 1. A more serious blow to General Public Utilities and its subsidiary, Metropolitan Edison, came from a recent US Court of Appeals opinion. That opinion upheld an earlier ruling that the NRC must consider psychological stress as a public health issue in the Environmental Impact Statement on the restart of TMI 1. Psychological stress was defined as the "post-traumatic anxieties, accompanied by physical effects, and caused by fears of recurring catastrophe." The NRC is waiting for a specific order from the court on what action to take and NRC attorneys are studying the opinion. An appeal to the US Supreme Court is one option being considered.

* * *

The last of the negative news involves Washington Public Power Supply System (WPPSS). Twelve Washington state electrical cooperatives, owning more than 10 percent of the cancelled WNP Units 4 and 5, are

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suing WPPSS. The twelve maintain they are not liable for repayment of bonds now scheduled to begin next January, or for termination costs now being assessed. They claim their original agreements with WPPSS call for termination payments when the WNP Units 4 and 5 are fully dismantled, an event which will not take place for several years at the earliest. Some fears have been expressed that if WPPSS loses the suit, it could be forced into receivership.

* * *

On the positive side, Commonwealth Edison received a fuel loading and lower power operating license for LaSalle 1. The NRC also authorized resumption of full operations for Rochester Gas and Electric's Ginna unit, forced into an unscheduled shutdown because of an accident in January 1982. Commonwealth Edison also received approval for an interim rate increase which the utility claims is needed to continue its nuclear construction program. However, the state's Attorney General has announced he is considering a court order barring the increase.

* * *

Connecticut Yankee Atomic Power Co. was granted a record 17 percent return on equity in a preliminary government ruling. The Federal Energy Regulatory Commission has to uphold the decision for it to become effective. It would set an encouraging precedent for utility investors.

* * *

The NRC's Atomic Safety and Licensing Board has authorized licensing of Pennsylvania Power and Light's Susquehanna Unit 1. The fuel loading and low power license has to be approved by the NRC staff and is expected in July; however, the unit is not scheduled to enter commercial operations until mid-1983.

* * *

The US Department of Energy released its "Short Term Energy Outlook" report showing nuclear power as the fastest growing US electric power source. The DOE's estimated 1982 share of electric power output was listed as:

Nuclear	13.4 percent
Coal	54.3 percent
Hydroelectric	11.8 percent
Oil	7.1 percent
Natural Gas	13.1 percent
Geothermal & Other	0.3 percent

* * *

The Reagan Administration formally asked Congress to dismantle the Energy Department. The bill calls for transferring nearly all DOE functions to the Commerce Department including safety, health and nuclear environmental programs. The Interior Department would take over some mining related programs such as leasing. The fate of the proposal is uncertain; there is strong opposition to the dismantling plan in the House of Representatives.

* * *

The US Senate passed the National Nuclear Waste Policy Act of 1982. Similar legislation is in hearings in the House. The Senate bill calls for a "federally owned and operated system for the interim storage of spent fuel at one or more AFRs." There is no indication of when the House will vote on a comparable measure.

* * *

The budget cutting mode of the Congress may affect a previously invulnerable project, the Portsmouth, Ohio uranium enrichment plant now under construction. Support for the project is faltering in both the House of Representatives and the Senate. DOE's argument that the plant is needed to meet future increased demand for enriched uranium fuel is being challenged by both Democrats and Republicans. The primary basis for legislators' criticism of the project came from two draft government reports, one by the Government Accounting Office and the other by the Congressional Research Service, which question the need for additional enrichment plant capacity. The GAO report went so far as to maintain that current enrichment capacity will be "ample" for the rest of this century.

* * *

Senator Domenici's bid to limit uranium imports to 20 percent of US reactor needs caught many interested parties by surprise, so initial reactions in the US were often either favorable or noncommittal. In recent weeks, however, opposition has increased and more arguments against the embargo proposal have been put forward. Consequently, it is quite unlikely that it will be passed by this session of Congress, except perhaps in a diluted version.

Opposition is coming from several different areas:

1. Most uranium users are reluctant to support a program which could increase their cost of fuel, especially if its effects could be felt in the near future.

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2. The Justice Department sees import restrictions as encouraging international cartels and subject to question under the General Agreement on Tariff and Trade (GATT).

3. The State Department and a number of congressmen see restriction as incompatible with the US policy of free trade.

4. Friendly nations — notably Canada and Australia — are lobbying hard against limitations on their exports. After supporting US non-proliferation policies, they expect the US to reciprocate by remaining a reliable trade partner, especially with respect to the nuclear fuel cycle.

5. The Department of Energy does not wish to relinquish cognizance over a sector of the nuclear field. Neither does the Nuclear Regulatory Commission seek responsibility for administering a program for restricting uranium imports.

Supporters of limitations emphasize the need for a viable, healthy uranium producing industry and for national self-sufficiency in energy. They are loath to see their country deliberately embark on a course of action which could lead to future dependence on foreign sources for such a basic fuel. Although others dismiss the parallel with oil, they view it as obvious.

They believe that the piecemeal actions of scores of individual utilities and regulatory bodies will not insure a vigorous domestic producing industry. Opponents insist that the fundamental problems of US uranium producers cannot be solved by unilateral US government action, but that they are a direct result of the decline of the US nuclear power business. Opponents also point out that many of those parties who have announced support for an embargo have vested interests to protect.

Although legal action limiting uranium imports to 20 percent of domestic need is unlikely, there is a growing feeling that "something will be done." Any such action could be largely symbolic, such as the commissioning of another in the long series of studies. Another possibility is a freeze at the present 40 percent of need which can be served by non-US uranium. US utilities would find it relatively easy to live with the latter limit.

* * *

Applification and Clarification

Nuexco Report 165 contained a brief discussion concerning US Nuclear Regulatory Commission staff views on which nuclear power plant licenses might be issued this year. This article amplifies the previous discussion, by presenting a summary of the licensing status of the reactors Nuexco believes are farthest along in the licensing process.

There are four nuclear plants for which a fuel loading and low power operating license has been authorized by the NRC staff or recommended by the NRC's Atomic Safety and Licensing Board (ASLB):

San Onofre 2	Southern California Edison
LaSalle 1	Commonwealth Edison
Susquehanna 1	Pennsylvania Power & Light
Summer	South Carolina Electric & Gas

The ASLB may recommend in 1982 a fuel loading and low power operating license for four additional reactors:

Zimmer 1	Cincinnati Gas & Electric
Grand Gulf 1	Mississippi Power & Light
Diablo Canyon 1	Pacific Gas & Electric
Diablo Canyon 2	Pacific Gas & Electric

It should be noted that a reactor's presence on this list does not necessarily imply that it will be one of the next eight units to receive a full power operating license in the US. For example, Diablo Canyon 1 received a fuel loading and low power operating license in late 1981, but it was suspended almost immediately when discrepancies were found in the earthquake safety design features. Design modifications are under review.

That sort of sudden, unanticipated setback could hit any one of the units listed in this article at any step in the licensing process. It is reasonable to infer that no units absent from these two lists are likely to receive a full power operating license this year. It is Nuexco's opinion that only four or five of these units will attain that goal.

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Sale:			
ACTIVE			
1575		500 per year	Long Term
1637	300		
1739	1,600		
1769A	130		UF_6
1818		250 per year	Long Term
1845	500		
1872	1,100	400	
1877	50		
1895	1,800		
1900	2,000		some UF_6
1906	290		
1909	2,200		UF_6
1916	2,000		UF_6
1921	1,700		UF_6
1925	500		UF_6
1928	1,000		UF_6
TOTAL:	15,170		
INACTIVE			
1581B		150 per year	Long Term
1610	150		
1664	100		
1774	50		
1804	615		
1805		500 per year	Long Term
1810		750	
1814	250		
1879	750		
1920	2,500		
1932	300		
TOTAL:	4,715		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
ACTIVE			
1742	500		
1815	1,000		
1884	275		
1919	3,000		
1931	600		
1932A	1,000		
1938	2,000		
TOTAL:	8,375		
INACTIVE			
1910	1,000		
1927	1,700		
TOTAL:	2,700		
Inquiries to Borrow:			
ACTIVE			
1780	260		
TOTAL:	260		
INACTIVE			
1621	300		
TOTAL:	300		

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[1] Measured from the date of this Report.

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MARKET DATA

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Inquiries to Purchase:			
ACTIVE			
1410		1,500 per year	5,000 Total
1638		300 per year	
1699	500		
1842		500 per year	2,000, start 85
1843	400		
1871	120	250 per year	1983-86
1914	50	150	
1915		500	UF_6
1923	30		
1924	300		
1933	[illegible]		
TOTAL:	1,560		
INACTIVE			
1459		200 per year	Long Term
1652		200 per year	Long Term
1888		500 per year	Long Term
1935		400	
TOTAL:			

[1] Measured from the date of this Report.

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MARKET DATA

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
ACTIVE			
1584	550	300 per year	Long Term
1607	1,000		
1609	500	1,500 per year	Long Term
1886	500		
1921	1,700		
1925	450		
1936	200	200 per year	Long Term
TOTAL:	4,900		
INACTIVE			
1619		300	
1661	200		
1840	300		
1902		350	
TOTAL	500		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
ACTIVE			
1622	700	700	
TOTAL:	700		
INACTIVE			
1594	400	450 per year	Long Term
TOTAL:	400		

[1] Measured from the date of this Report.

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller Group	Buyer Group	Remarks
1669	1982	101-300	117	US	US	
1796	1982	101-300	111	US	US	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller Group	Buyer Group	Remarks
1770	1982	301-600	125	US	US	

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[1] Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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CLUFF LAKE PROJECT — PART III

Geology

The majority of uranium deposits discovered in northern Saskatchewan occur in close association with the regolith zone and the unconformity between Aphebian crystalline basement rock and overlying the Helikian Athabasca Formation. This relationship is well expressed in deposits along the east margin of Athabasca basin. The Cluff Lake deposits occur in the same geologic environment, but within the basin interior where the unconformity has been exposed by structural deformation and erosion.

The Cluff Lake uranium deposits occur within the central limits of the Carswell Dome. The domal features consist of multiple circular fault zones with a central core of crystalline basement rock. The Athabasca Formation, in turn, surrounds the Archean core and marks the horizon of the unconformity. Uranium mineralization has been found in the Athabasca Formation, the regolith zone and Archean rocks at the unconformable contact and at depth in the Archean rocks.

The Carswell structure is the most prominent geologic feature to be found in the otherwise flat and featureless Athabasca basin. The outer ring of the structure is about 35 km in diameter; the central core is 17 to 18 km in diameter. The outer ring consists of uplifted and eroded blocks of the Carswell Formation, a bedded dolonite, and the underlying Douglas Formation which is made up of interbedded siltstones, shales and fine-grained sandstones. The two formations are only found in the Carswell structure and neither is known to contain uraniuim mineralization. Figure 1 shows the general geology of the structure and the ring faulting. The area designated the "wedge" is the area of uranium mineralization.

The Douglas Formation conformably overlies the Athabasca Formation which, in turn, makes up the zone of 5 to 8 km between the outer rim formations and the Archean core. The Athabasca consists of highly folded and faulted quartz-pebble conglomerates, quartzites and sandstones. Generally, all sediments dip toward the center of the structure, but vertical and overturned beds are common, especially in the Athabasca Formation. The basement rocks reveal evidence of metamorphism, folding and faulting as related to earlier periods of orogenesis; however, they also show the effects of structural changes associated with the Carswell structure. In fact, preserved segments of the Athabasca/basement rock contact show normal to completely overturned sequences.

The basement rock and the Athabasca Formation have been further disturbed by intrusions of rhyolite and associated dike-like breccia zones which contain fragments of all rocks known to occur within the structure. The intrusions have been age-dated at about 470 million years (m.y.) compared to 2500 m.y. for the basement rocks and 1350 to 1400 m.y. for the Athabasca Formation. Table 1 is a generalized stratigraphic and orogenic time correlation chart for the geology of the Carswell structure.

Table 1

GENERALIZED STRATIGRAPHIC AND OROGENIC TIME CORRELATION CHART OF THE GEOLOGY OF THE CARSWELL STRUCTURE

Geologic Period	Event Formation/Orogeny	Age Estimate (million years)
Cenozoic	Pleistocene/Recent Glacial/fluvial Lacustrine deposition	~2
	— — — — Unconformity — — — —	
Ordovician		
	Carswell Intrusions	470 plus
	Carswell Structure	490-465
Middle	HELIKIAN ERA	1650-1300
Proterozoic	Carswell Formation	1300 plus/minus
	Douglas Formation	1300 plus/minus
	Athabasca Formation	1300 plus
	— — — — Unconformity — — — —	
	Regolith	1630 plus
Lower	HUDSONIAN OROGENY	1735
Proterozoic	APHEBIAN ERA	1850-1700
	Firebag Domain	2480-1700
	— — — — Unconformity — — — —	
	KENORAN OROGENY	2480 plus
Archean	Firebag Domain	2500 plus
	Basement	2500 plus

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RAW MATERIALS

The origin of the Carswell structure remains controversial to many geologists. The favored geologic interpretation suggests the structure resulted from meteoritic impact. This interpretation is supported by such evidence as an abundance of shattered and recemented quartz pebbles and boulders in the basal conglomerates of the Athabasca Formation, the breccia dikes and varying degrees of metamorphism noted in the basement rock and the Athabasca Formation, and, of course, the symmetry of the multi-ring faulting around the outer limits of the structure.

The less popular theory of origin considers deformation of the sediments due to a domal intrusion of Archean Crystalline rocks during Middle Proterozoic time. The intrusion caused upheaval of the overlying sediments, associated ring faulting around the outer edge of the domes infuence, and related metamorphism of the Athabasca Formation and the regolith zone where there was close contact with the intrusive body. Rapid subsidence of the crystalline mass occurred during the development of the Athabasca Basin in Quaternary time. This allowed the uplifted blocks of sediments to subside toward the center of the structure, causing secondary ring structures and overturned fault blocks. In either case of origin, extensive erosion during Quaternary time has left the basement rock, the regolith zone and the Athabasca Formation exposed throughout the central portion of the structure. All three rock-types are host to uranium mineralization.

Geology of Mineralized Area

The important uranium deposits discovered at Cluff Lake are limited to a small wedge of basement rock in the south-central part of the Carswell Structure. The wedge is about 2000 meters wide at the D & N deposits narrowing to less than 600 meters at the Claude deposit 3400 feet to the northwest. In addition to the five uranium deposits located in the wedge, at least twelve more anomalous areas of potential interest were discovered. Follow-up evaluation of the 12 areas led to the discovery of highly radioactive rocks and mineralized boulders. At least half of the anomalies are in the Athabasca Formation and, to date, do not constitute economically important discoveries. The remaining anomalies are in basement rock and/or gneisses, all of which offer only limited potential for minable ore. However, exploration for additional ore occurrences with the unconformity is continuous by the joint venture. Figure 2 shows the location of the main mineral zones and the geology within the wedge.

The geology within the wedge is primarily broken blocks of basement rock and highly faulted sections of regolith and Athabasca sandstone and conglomerates, some of which are completely overturned. The basement material consists almost entirely of quartzitic gneisses and red granitoid gneisses interlayered with quartzites and meta-arkoses and meta-pelites of the Clearwater/Firebag domains. The closely-related domains are the western-most lithostructural units recognized in the Athabasca basin.

The regolith mantle varies in thickness from a few meters to about 40 meters. It represents the highly altered and eroded Aphebian surface. The mantle is consistently maroon in color due to strong hematite alteration. Outcrops of regolith have formed along a parallel northwest-southeast fault zone that cuts both the Athabasca Formation and the basement rock.

Blocks of Athabasca Formation cover the wide end of the wedge. It is in contact with the basement rock and a red granitoid gneiss. It consists mostly of conglomerates up to cobble size, grading into fine to coarse sandstones and interbedded shales away from the contact. Certain horizons of Athabasca are colored pink to maroon due to hematization. However, alteration and coloration is more intense adjacent to the contact with the regolith.

Cluff breccias and quartzitic gneisses cover much of the area in the northwest half of the wedge. They occur as large bodies in a general northwest trend, but narrow bands up to four or five meters are not common. The breccia contains angular fragments of every rock-type represented in the Carswell structure. In all probability, the breccia zones developed during the tectonic activity related to the structure itself.

Uranium Deposits

Uranium mineralization is found primarily in the quartzitic gneisses, the red granitoid gneisses and the Athabasca Formation. Of the five ore deposits delineated within the wedge-zone, the D deposit has been mined out, preparations to mine the Claude and the N deposits are in progress, and the Dominique deposit is in the final evaluation stage; the O-P deposit is considered sub-economic in today's market environment.

The first ore deposit found by Amok was the unusually high-grade D deposit. The deposit contained massive pitchblende up to five meters thick along the unconformity of an overturned block of the Athabasca

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Formation. Mineralization was concentrated in Athabasca pelites and quartzitic gneisses of the regolith zones. The ore was confined to a zone about 140 meters by 25 meters (see Part II in Report 165 for a detailed description of the deposit). Uraninite was a companion mineral to pitchblende, both of which were associated with carbonaceous organic matter in the sediments. The deposit contained a number of accessory minerals, but primarily native gold and gold tellurides, selenium and nickel. The mineralization was age-dated at 1100 million years.

The N and Claude deposits are very similar in occurrence. The ore is found in highly faulted blocks of basement rock. The host rock is primarily quartzitic gneiss and pelitic gneiss. Mineralization occurs within shear zones and along the fault contact between the two gneisses. Abundant mineralization is located within the thicker mylonites associated with the nearly horizontal faulting and in associated Cluff breccias. The main ore minerals are uraninite and coffinite; galena, graphite and molybdenite are the most abundant accessory minerals present.

The O-P deposit is in highly faulted and fractured rock along the unconformity. This resembles the D deposit in nature of occurrence in the regolith and the Athabasca Formation; even the mineral suite is almost the same. The main difference is the fact that the O-P is low-grade ore.

The Dominique deposit is similar to the Claude deposit. It is smaller and of lower grade, but host rock and mineral assemblage are compatible.

The placement of ore in the Cluff Lake area probably took place between 1100 and 1400 million years ago. The uranium is considered to have originated by precipitation from groundwater in fractures, faults and other traps in the basement rocks, probably during the Hudsonian Orogeny. Following a prolonged period of hydrothermal and tectonic activity and deposition of the Athabasca Formation, the uranium mineralization was at least partially remobilized to create enriched mineral zones in the basement rock and form new mineral deposits in the regolith and Athabasca Formation. The process continued throughout the evolution of the Carswell structure, and possibly well into early Cenozoic time.

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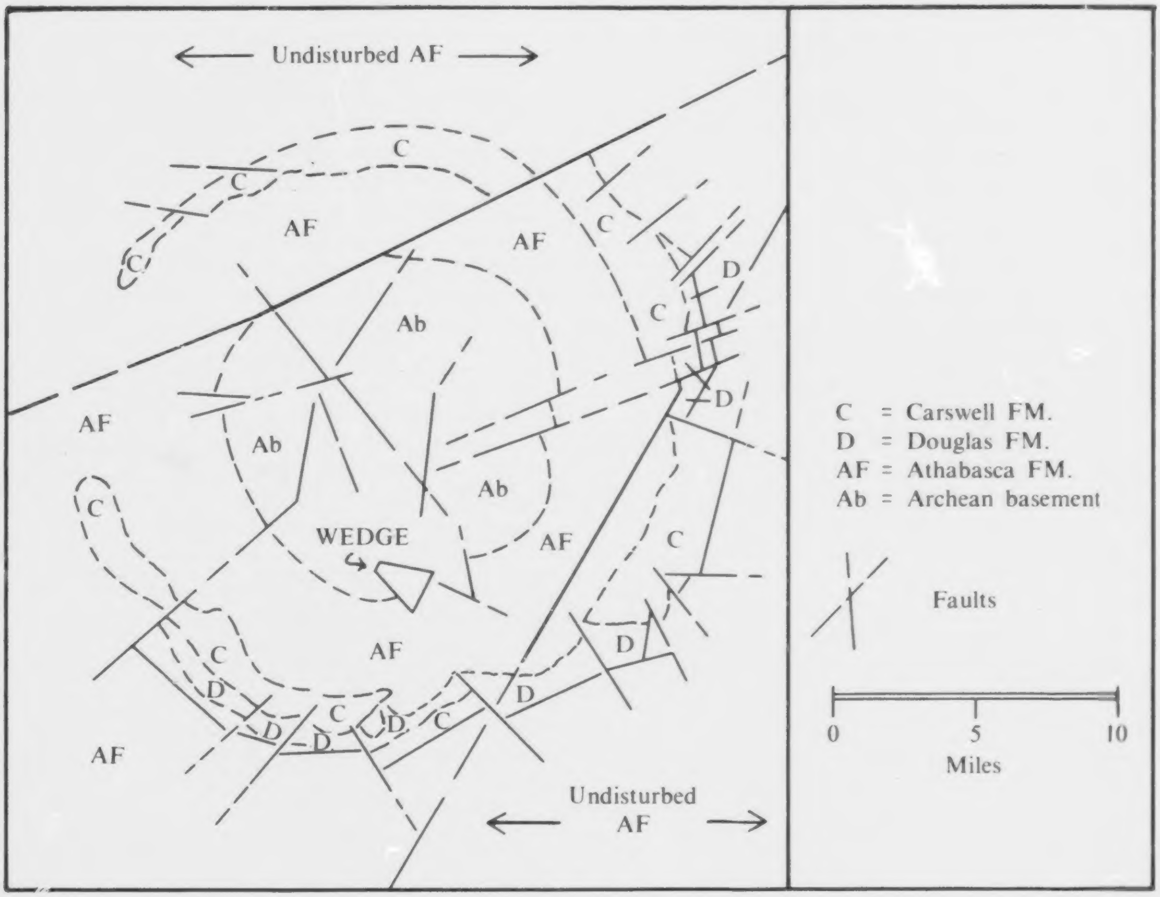
Undisturbed AF
C
AF
Ab
WEDGE
D
Undisturbed AF
C = Carswell FM.
D = Douglas FM.
AF = Athabasca FM.
Ab = Archean basement
Faults
0
5
10
Miles

Figure 1

GENERAL GEOLOGY OF THE CARSWELL STRUCTURE
NOTE LOCATION OF MINERALIZED WEDGE.
(Adapted from Tapaninen, 1975)

© NUEXCO 1982

RAW MATERIALS

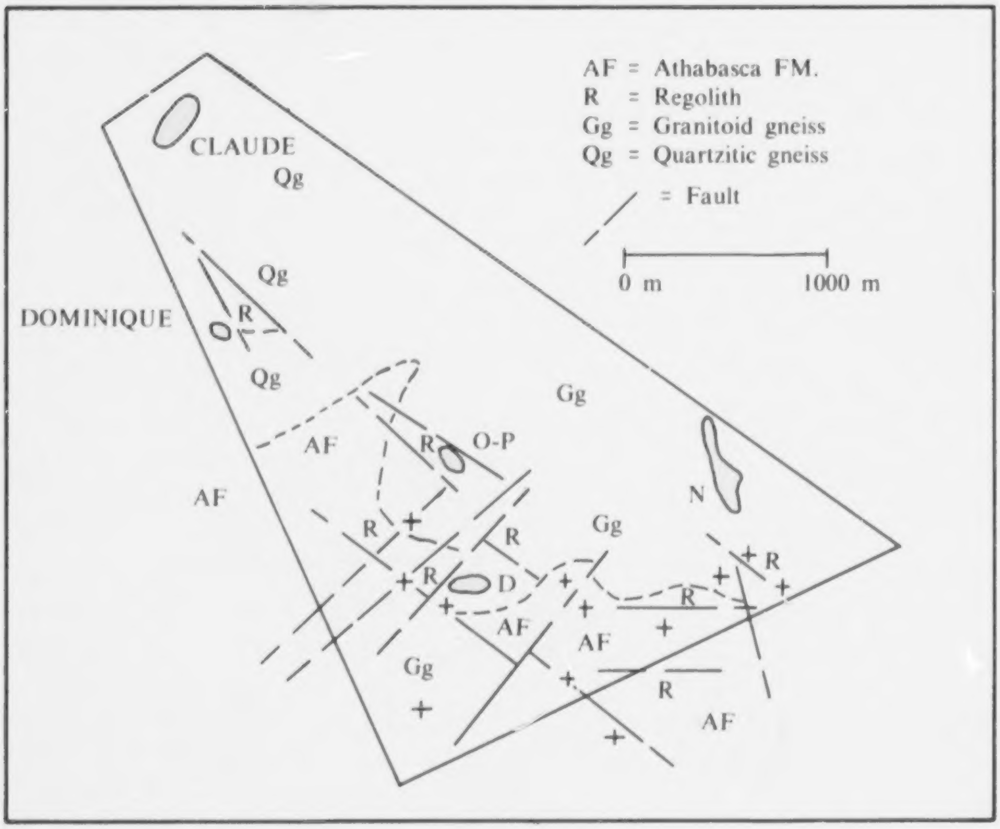
AF = Athabasca FM.
R = Regolith
Gg = Granitoid gneiss
Qg = Quartzitic gneiss
= Fault
0 m
1000 m
CLAUDE
Qg
Qg
DOMINIQUE
R
Qg
Gg
AF
R
O-P
AF
N
R
R
Gg
R
R
D
R
AF
AF
Gg
R
AF

Figure 2

MINERALIZED WEDGE LOCATED IN SOUTH PART OF ARKEAN BASEMENT CORE, SHOWING FIVE URANIUM DEPOSITS & MINERALIZED AREAS.
(Adapted from Harper, 1980)

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STATISTICAL DATA

EXCHANGE VALUE $20.50/lb. U_3O_8
Determined as of May 31, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of May 31, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
22.70	4.0	15	4

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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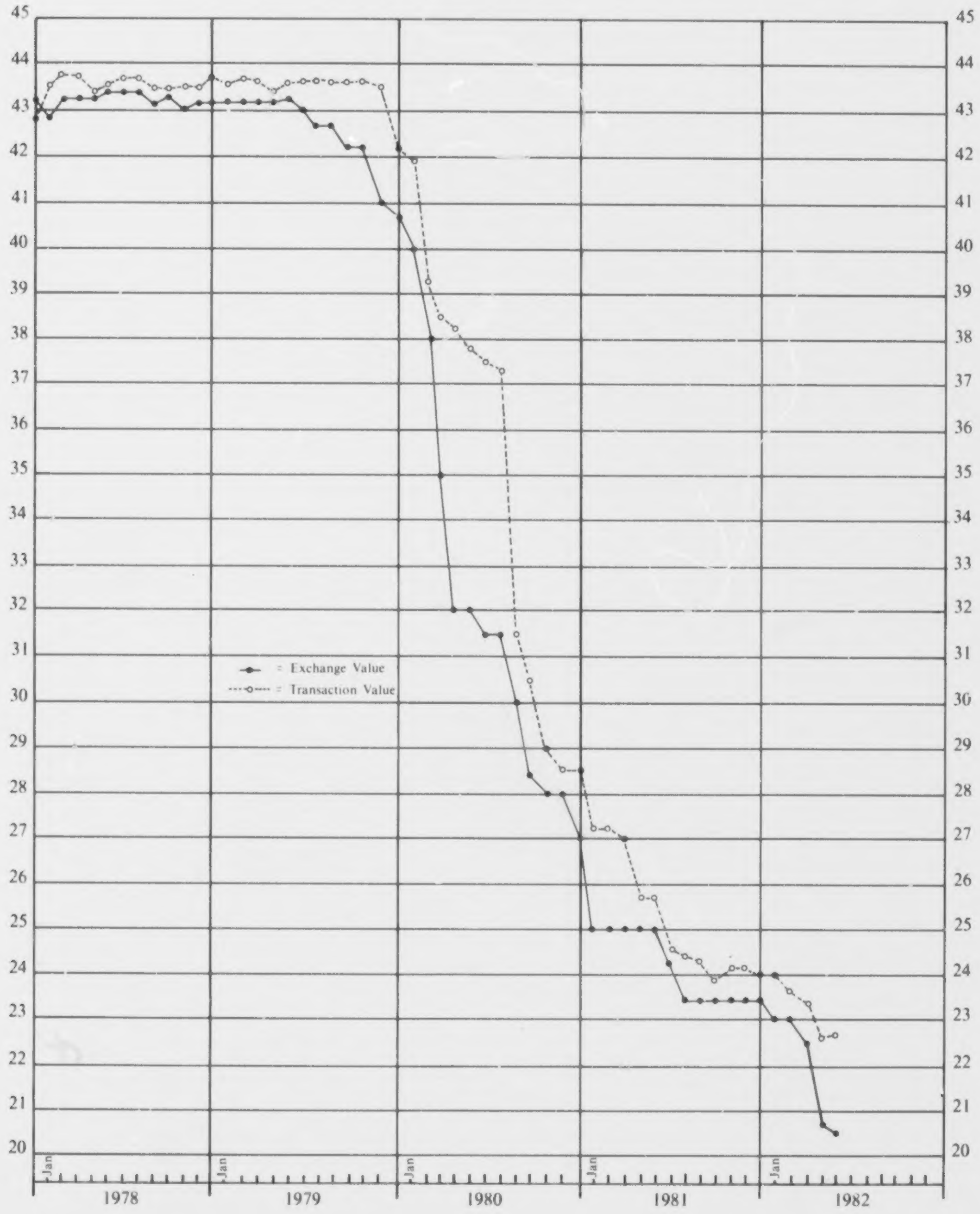
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES
SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50							

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70							

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	20.50	45.19	53.30
France (franc)	125.08	275.75	325.17
FRG (mark)	47.92	105.64	124.58
Japan (yen)	4,972	10,962	12,926
Switzerland (franc)	40.72	89.76	105.85
UK (pound)	11.41	25.15	29.66
Australia (dollar)	19.50	42.99	50.69
Canada (dollar)	25.42	56.05	66.10
Niger, Gabon (CFA)	6,212	13,695	16,150
South Africa (rand)	22.10	48.71	57.44
Sweden (kroner)	119.95	264.45	311.85

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.00/lb. U as UF_6
Determined as of May 31, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of May 31, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00
Annual Avg. 1981	355.3R	237.27R
Dec 1980	351.7	222.41
Jan 1981	357.8	230.58
Feb 1981	356.6	230.41
Mar 1981	355.2	229.66
Apr 1981	354.6	229.38
May 1981	353.4	237.31
Jun 1981	360.4	237.93R
Jul 1981	356.9	237.86R
Aug 1981	359.9R	237.86R
Sep 1981	357.4R	237.82R
Oct 1981	351.6R	239.26R
Nov 1981	350.3R	241.13R
Dec 1981	348.9R	258.01R
Jan 1982	353.9P	259.76R
Feb 1982	355.8P	259.56P
Mar 1982	—	259.56P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Annual Avg. 1981	—	12.02	9.03	9.53
Mar 1981	265.5	11.47	8.63	9.17
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0	11.80R	8.90	9.49
Jun 1981	272.3	11.80R	9.16	9.57
Jul 1981	274.3	11.92R	9.20	9.62
Aug 1981	276.2R	11.83R	9.15	9.63
Sep 1981	276.9	12.47R	9.22	9.77
Oct 1981	279.3R	12.78R	9.35	9.91
Nov 1981	278.8R	12.89R	9.45	9.89
Dec 1981	279.9R	12.87R	9.42	10.03R
Jan 1982	281.7R	13.09P	9.53P	10.10R
Feb 1982	283.1R	13.24P	9.61P	10.19P
Mar 1982	284.0P	—	—	—
Apr 1982	286.5P	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Nov 1980	—	187.8	205.6	716,797	208,345
Dec 1980	37.69	189.9	206.5	705,087	211,829
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	725,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	—	—
Feb 1982	—	220.2	236.8	—	—
Mar 1982	45.49	225.2	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.57	11.97	9.12	7.65
Jun 1981	305.1	294.5	271.3	191.06	11.31	11.88	9.07	7.60
Jul 1981	306.2	296.0	274.4	—	11.61	12.19	9.16	7.69
Aug 1981	307.2	296.2	276.5	—	11.85	12.09	9.19	7.76
Sep 1981	307.4	295.7	279.3	195.61	12.11	12.68	9.38	7.79
Oct 1981	309.0	296.1	279.9	—	12.09	12.43	9.37	7.84
Nov 1981	309.3	295.9R	280.7	—	12.14	12.47	9.42	7.86
Dec 1981	310.0R	295.8R	281.5	200.10	12.09	12.44	9.52	7.93
Jan 1982	311.7P	298.2P	282.5	—	12.21	12.65	9.68	8.02
Feb 1982	311.4P	298.5P	283.4	—	12.23	12.59	9.68R	8.00
Mar 1982	311.0P	297.9P	283.1	201.84R	12.30P	12.67P	9.66R	8.06R
Apr 1982	309.9P	297.9P	284.3	—	—	—	9.79P	8.09P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
	(Referenced to May 31, 1982)		
Exchange Value[1]	20.50	20.75	25.00
Transaction Value[1]	22.70	22.60	25.70
Conversion Value[2]	1.00	1.20	1.15
Loan Use Charge Rate[3]	6%	6%	7%
Near-Term Uranium Supply[4]	15.2	13.0	7.7
Near-Term Uranium Demand[5]	1.6	1.4	1.8
Near-Term Supply-Demand Ratio	9.5	9.3	4.3
Optimum Tails Assay[6]	.318	.318	.281
Current Transactions[7]:			
Number of Transactions	2	3	3
Quantity of Material[8]	0.2-0.6	0.7-1.4	0.4-0.8

[1] US $ per pound U_3O_8 equivalent
[2] US $ per pound U as UF_6
[3] Percent per annum
[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6] Percent U_{235}
[7] Uranium transactions only; does not include loans or conversion transactions
[8] Millions of pounds U_3O_8 equivalent

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NUEXCO REPORT 166
EXECUTIVE SUMMARY

Exchange Value Drops 25 Cents, to $20.50

The **Exchange Value** as of May 31, 1982 is $20.50 per pound U_3O_8. The drop of $0.25 since last month represents a refinement of downward trends evident last month.

Near-Term Supply and Near-Term Demand Increase

Active sellers in the zero to one year time frame are offering 15.2 million pounds U_3O_8, up 2.2 million pounds from last month. *Active* uranium demand in the zero to one year time frame increased slightly to only 1.6 million pounds U_3O_8. Consequently, the ratio of near-term supply to near-term demand increased slightly from 9.3:1 last month to 9.5:1 this month.

Transaction Value Increases Ten Cents, to $20.70

The **Transaction Value** as of May 31, 1982 is $20.70 per pound U_3O_8. It includes fifteen transactions totaling 4.0 million pounds U_3O_8 and covers a period of four months. The slight increase since last month is due to the closing of two transactions for which negotiations began some months ago, when price levels were higher.

Two Uranium Sales Reported

Two uranium sales are reported this month. The total quantity falls in the range of 0.2 million to 0.6 million pounds U_3O_8. Both were US producer-to-producer transactions.

Conversion Value Drops 20 Cents, to $1.00

The **Conversion Value** as of May 31, 1982 is $1.00 per pound U as UF_6, down 20 cents from last month. One conversion transaction is reported. One US utility sold another US utility conversion services for 300-600 thousand pounds U. As anticipated for the past two months, substantial additional conversion services did enter the secondary market during May. Active sellers are offering 4.9 million pounds U in near-term conversion services, while active demand amounts to only 700 thousand pounds U in near-term conversion services.

Esso Withdraws From Western Mining's Yeelirrie Joint Venture

Esso Exploration and Production Australia, Ltd. announced its withdrawal from the Yeelirrie joint venture. Esso was to have provided half of the development funding for the project and was to have received half of its projected 6 million pounds annual output. Although Esso's action appears to be a setback for the project, it does free Western Mining to offer equity participation as an incentive to potential buyers of Yeelirrie's output.

Australian Government Warns US Against Imposing Import Embargo

The Australian government has threatened to mount a challenge under the General Agreement on Tariffs and Trade if Congress passes the embargo legislation which is now in conference committee.

Europeans React To Proposed US Embargo

European reaction to the prospect of a US embargo on uranium imports has been quite negative. Economic arguments aside, Europeans point out that the US would harm itself by such a move.

Taiwan Nuclear Power Program Reviewed

Taiwan plans to have twelve nuclear units in operation by the year 2000.

Cluff Lake Project Discussed

The *Raw Materials* section contains the third and final installment in a series of articles on Canada's Cluff Lake project, owned by Amok, Ltd. and SMDC.

US Import Embargo Unlikely

Opposition to the proposed uranium import embargo is increasing within the US.

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JULY 1982 NUMBER 167

Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

July 1982 No. 167

R. WESLEY MILLER, *EDITOR*

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FOREWORD

Last month's Executive Summary (Report 166 of June, 1982) contained an error in the Transaction Value. It should have reported the Transactioin Value as of May 31, 1982 as $22.70, *not* $20.70. The Transaction Value was *correctly* stated elsewhere in Report 166.

Please replace the incorrect copy of June's Executive Summary with the corrected copy enclosed in this Report.

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of June 30, 1982 is $19.25 per pound U_3O_8, down $1.25 from last month's level of $20.50. Sellers continued their vigorous competition for the limited business available in the current market. The drop of six percent continued the sustained decline of the Exchange Value.

Last month, Report 166 noted "as much as five million pounds of additional U_3O_8 could become available at almost any time." One seller entered the market at competitive prices with a large block of material previously listed in the Inactive category. Active sellers are now offering 17.8 million pounds U_3O_8 for sale in the zero to one year time frame, up 2.6 million pounds from last month.

Active uranium demand in the same time frame dropped by more than 30 percent, to 1.1 million pounds U_3O_8. Consequently, the ratio of near-term supply to near-term demand rose substantially, from 9.5:1 last month to 16.2:1 this month. The aggravated imbalance between supply and demand made itself felt in increased downward pressure on prices throughout the month.

* * *

Transaction Value as of June 30, 1982 is $21.50 per pound U_3O_8, down $1.20 from May. June's Transaction Value includes 11 transactions totaling 2.6 million pounds U_3O_8 and covers a period of four months. The *Market Data* section lists 6 transactions this month.

* * *

The **Conversion Value** as of June 30, 1982 is $1.00 per pound U as UF_6, unchanged from last month. Active sellers are offering 4.5 million pounds U in near-term conversion services, while active demand in the same time frame amounts to only 300,000 pounds U. No conversion transactions are reported this month.

* * *

The **Loan Use Charge Rate** remained at six percent. At least one and possibly more loan transactions are under discussion at that general level.

AUSTRALIA

Denison is encountering continuing problems in its attempts to develop the Koongarra deposit in the Northern Territory. The traditional (Aboriginal) landowners have rejected proposed changes to the lease boundaries which had been intended to correct a cartographical error made when the government enacted the National Park legislation for the area.

Because the deposit is in the center of the Kakadu National Park, the Northern Land Council had proposed that the ore should be milled outside the park at ERA's Ranger mill. This suggestion was not received favorably by federal departments, so Denison's attempts to develop the deposit received a second setback.

* * *

Described by the South Australian Premier as a "once-in-a-lifetime opportunity" for the state, the Roxby Downs project faced indefinite deferral when the Indenture Bill was defeated in the Upper House by an 11 to 10 vote. However, shortly after the crucial vote was taken, a prominent opposition member resigned from Parliament, opening the door for the bill to be presented once again. The new vote produced a tie and the bill passed when the president of the Upper House cast his vote in favor of the bill. The Roxby Downs indenture is now law in South Australia, regulating the rights and obligations of the state and the developers.

Unofficial estimates indicate that the deposit contains at least 7.5 million metric tons of copper and 1,180 million pounds U_3O_8. Although the Roxby Downs uranium content is not included in official estimates of Australia's uranium resources, the deposit could contain almost twice as much as the total Australian resources, officially estimated at 674 million pounds U_3O_8 (reasonably assured resources under $80/kg U_3O_8). The Roxby Downs uranium ore grade is fairly low, so uranium would be produced as a byproduct of copper.

* * *

Ratification of the final agreement between Aboriginal landowners and the Jabiluka partners is expected before the end of June. A recent opinion poll has found that more than 80 percent of the inhabitants of Darwin, and 70 percent of the total population of the Northern Territory, favor uranium mining. This popular support for the industry has prompted the local Labor Party leadership to request the National Party Conference, to be held in July, to revise its hardline policy against uranium mining and export.

The local leader has urged the party to support the mining, processing and export of uranium in the event the Labor Party wins the federal elections. Encouraged by these favorable attitudes, the Northern Territory Government has renewed its bid to establish Australia's first enrichment plant.

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MARKET ACTIVITIES

CANADA

This month brought reports of a number of sales by the Key Lake Partners.

1. Ontario Hydro announced that it had purchased 13.5 million pounds from Eldorado Nuclear and Uranerz Exploration & Mining Ltd.

2. Eldorado also renegotiated an earlier sales agreement with a US utility and increased the quantity by one million pounds.

3. SMDC is believed to have signed long term sales agreements with both a US and a European customer.

Recent long term Canadian sales contracts are all believed to be related to market prices at the time of delivery with a floor price and, sometimes, a ceiling. Floor prices offered over the past two years have roughly approximated spot market prices at the time the offers were made. Floor prices have dropped as spot prices have dropped. Their willingness to adjust to the realities of the market is the primary reason the Canadian sellers have been so successful in obtaining new sales commitments. Now that Key Lake is essentially base-loaded and the Exchange Value is below $20 per pound, the need to sell more material soon is greatly reduced. Nuexco expects a decrease in the contracting rate, as compared to the past year or so, and somewhat of a letup in the aggressive Canadian sales efforts.

FAR EAST

Japan recently completed two small, but significant, steps in pursuit of increased self-sufficiency in the nuclear fuel cycle. PNC's pilot enrichment plant began full operation with some 7,000 centrifuges capable of producing about 50,000 swu annually. At the same time, batch operations began at an unusual pilot plant for UF_6 production. The UF_6 plant, having an annual capacity of approximately 400,000 pounds U, produces UF_6 directly from uranium ore without going through the U_3O_8 stage. PNC is studying the potential of constructing such plants at mine sites abroad, making possible the direct import of UF_6.

Plans call for expansion of enrichment capacity in incremental steps. A demonstration plant with an annual capacity of 250,000 swu is scheduled for operation in 1986. Commercial facilities are due for start-up in the late 1980s with a goal of 1 million swu annual capacity by 1995 and 3 million swu annually by the year 2000. Even should these targets be met, Japan will still have to import a substantial portion of its swu requirements.

In both of the cases cited above, the apparent aim is to develop technology and increase security of supply through diversity and indigenous capability. Of course, such goals depend on the continued availability of uranium, a resource almost completely lacking in Japan. Security of uranium supply continues to be achieved by long-term contract, diverse sources and large inventories.

* * *

Japan and Australia have concluded a new bilateral safeguards agreement, on which negotiations first began in 1978. The agreement, initialed in January of this year and signed in March, is now before the Diet in Japan and the appropriate ministers in Australia. Ratification will probably occur shortly; if so, the agreement could enter into force as early as July, 1982. The new agreement follows the same general format as other recent Australian bilaterals, emphasizing provisions relating to re-transfer, reprocessing and enrichment above 20 percent.

* * *

A recent article in the Japanese press commented that the spot U_3O_8 price had declined sharply and could possibly go below $20 per pound in the near future. The article noted that Japanese utilities are paying more than $35 per pound for uranium being delivered under long-term contracts and may, as a consequence of the difference between such prices and current spot prices, be required to reconsider the advisability of further long-term contracting. The article concluded, however, that it would be premature to infer that a change in Japanese contracting philosophy is imminent. Two reasons were cited:

1. The difficulty of guaranteeing, in advance, that large quantities will continue to be available in the spot market;

2. Spot market prices are inherently volatile, so a sudden upward movement could reverse today's situation so that spot prices could substantially exceed prices negotiated under long-term contracts.

Nevertheless, it is interesting that the question has been raised publicly in Japan, where security of long-term raw materials supply has long been a watchword. While no fundamental changes are likely, it is reasonable to anticipate that Japanese negotiating positions will continue to harden while the market remains weak.

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MARKET ACTIVITIES

UNITED STATES

During June, the negative trend in the US nuclear power industry continued. Actions taken by various organizations will delay the construction of several more nuclear power units. The combined effects of this month's developments and those of recent months will lead to further decrease of the already weakening US demand for uranium.

This month the Nuclear Regulatory Commission's (NRC) Atomic Safety and Licensing Board (ASLB) denied a full power operating license for Cincinnati Gas and Electric's Zimmer nuclear unit, citing problems with the offsite emergency preparedness plan. In addition, the ASLB specified certain additional conditions that must be met before it would authorize a low power operating license. At this point, it is unlikely that the Zimmer unit can begin operating before 1983. Commercial operations had been scheduled to begin this year.

* * *

Southern California Edison indicated it will make the necessary seismic safety design changes to its San Onofre 1 unit rather than defend its existing design to the NRC. The modifications will probably take the rest of 1982 to complete.

* * *

Zimmer's delay and San Onofre Unit 1's one year shutdown will reduce uranium burnup in the short term. That translates into reduced uranium demand in the intermediate or long term. Table 1 summarizes the delays noted in this Report and in Report 166.

The events noted in Table 1 represent cumulative lost demand of about 5.5 million pounds U_3O_8. Although that amount is only one percent of US utilities' estimated reactor requirements (410 million pounds through 1990), it is still significant, for three reasons.

1. That amount is equivalent to the uncommitted supply of any one of several US uranium producers.
2. That amount is only the result of a two-month period.
3. The effects weigh more heavily in the short term than if they were spread more evenly over the decade.

Table 1

US REACTOR DELAYS REPORTED IN NUEXCO REPORTS 166 and 167

Reactor	Utility	Delay
Clinton 1	Illinois Power	Commercial operations delayed 1 year to 1985
Limerick 2	Philadelphia Electric	Likely to be delayed 5 years to the early 1990s
WNP 1	WPPSS	Delayed 2 to 5 years; earliest COD 1991
Hanford 1 & 2	Puget Sound	Indefinitely delayed
San Onofre 1	Southern Calif. Edison	Delayed one year for seismic modifications
Zimmer	Cincinnati Gas & Electric	Delayed until 1983 by problems with offsite emergency preparedness plan

* * *

Reactor setbacks are still affecting the development plans for new uranium mines. One such mine, the Lee Mine in New Mexico, was placed on standby for up to three years by the developer, Kerr McGee. Philadelphia Electric was also participating in the project, so it is not unreasonable to think the latest delay associated with Limerick Unit 2 (see Table 1) influenced the decision to delay the Lee Mine.

* * *

US companies currently producing uranium continue to be pressured by foreign, especially Canadian, competition to supply the unfilled requirements of US utilities. During the first six months of 1982, several major uranium sale contracts have been reported in various uranium industry publications other than the Nuexco Report. Those sales involved approximately 30 million pounds of uranium. Just over half of the contracts, for approximately 15 million pounds, went to non-US companies for uranium to be produced in Canada.

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MARKET ACTIVITIES

Two conclusions that one can draw from this are:

1. Canadian producers are winning a large share of the current US demand for long term or large quantity contracts.
2. It is still possible for US producers to make sales by competing aggressively for available business.

* * *

The US Supreme Court agreed to review for Pacific Gas and Electric and Southern California Edison the US Court of Appeals decision upholding California's moratorium on new construction and operation of nuclear power plants. The Supreme Court will consider whether the state's rights to impose such a moratorium are preempted by federal law.

Seven states have laws prohibiting in some way new construction of nuclear plants: California, Connecticut, Maine, Maryland, Montana, Oregon and Wisconsin. If states' rights to regulate nuclear power are upheld, it is likely additional states will pass similar legislation.

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Sale:			
ACTIVE			
1575		500 per year	Long Term
1637	180		
1739	1,600		
1818		250 per year	Long Term
1845	550		
1872	800	400	
1877	50		
1895	1,800		
1900	2,000		some UF_6
1906	60		
1909	2,200		UF_6
1916	2,000		UF_6
1920	3,000		
1921	1,700		UF_6
1925	500		UF_6
1928	1,000		UF_6
1941	300		
1952	26		
TOTAL:	17,766		
INACTIVE			
1581B		150 per year	Long Term
1610	150		
1664	100		
1774	50		
1804	615		
1805		500 per year	Long Term
1810		750	
1814	250		
1932	300		
TOTAL:	1,465		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
ACTIVE			
1742	500		
1815	1,000		
1884	275		
1919	3,000		
1931	600		
1932A	1,000		
1938	2,000		
1939	800		
TOTAL:	9,175		
INACTIVE			
1910	1,000		
TOTAL:	1,000		
Inquiries to Borrow:			
ACTIVE			
1780	260		
TOTAL:	260		
INACTIVE			
1621	300		
TOTAL:	300		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Inquiries to Purchase:			
ACTIVE			
1638		300 per year	
1699	500	400	
1842		500 per year	2,000 Total
1871		250 per year	1983-86
1915		500	UF_6
1924	400		
1933	160		
1945		500	
TOTAL:	1,060		
INACTIVE			
1410		1,500 per year	5,000 Total
1459		200 per year	Long Term
1652		200 per year	Long Term
1843	400		
1888		500 per year	Long Term
1923	30		
1935		400	
1942	250		
TOTAL:	680		

[1] Measured from the date of this Report.

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MARKET DATA

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
ACTIVE			
1584	550	300 per year	Long Term
1607	600		
1609	500	1,500 per year	Long Term
1886	500		
1921	1,700		
1925	450		
1936	200	200 per year	Long Term
TOTAL:	4,500		
INACTIVE			
1619		300	
1840	300		
1902		350	
TOTAL	300		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
ACTIVE			
1622	300	700	
TOTAL:	300		
INACTIVE			
1594	400	450 per year	Long Term
TOTAL:	400		

[1] Measured from the date of this Report.

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller	Buyer	Remarks
1778	1982	101-300	95	US Utility	US Utility	Pending required government approval
1779	1982	101-300	95	US Utility	US Utility	Pending required government approval
1808	1982	51-100	—	Non-US Government	Non-US Entity	Definitive price info not available
1824	1982	1-50	—	US Producer	US Producer	Definitive price info not available
1828	1982	101-300	99-100	US Utility	US Utility	
1840	1982	51-100	99	US Producer	US Producer	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller	Buyer	Remarks

There are no conversion transactions reported this month.

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[1] Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.

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URANIUM PRODUCTION COST DISTRIBUTIONS

Introduction

The Exchange Value's decline over the past three years has confronted many uranium producers, particularly those in the US, with the uranium industry's own version of the classic business dilemma of make-versus-buy. Specifically, some high-cost uranium producers having existing supply contracts may be in a position to determine whether they will fill their contracts with their own production or with material purchased on the spot market.

In making this choice of producing versus procuring, the decision would ideally be reduced to two comparative costs from which the cheapest option for the company would be chosen. Unfortunately, in practice, this is usually not the case. The decision is complex, and consists of at least two considerations: (a) the quantitative, deriving the economic comparison of the two options, and (b) the qualitative, which consists of all the intangible factors that go into such a decision.

In determining the quantitative difference between producing versus procuring, the controlling concept is usually the producer's *variable* forward cost of production.

The concept of *variable forward costs of production* can be useful in industry analysis, particularly during periods of oversupply. (When demand overwhelms available supply, *full costs of production* become more relevant to the market.) An analysis of variable forward costs can give some indications of the price level at which the production sector will experience cost pressures.

Before applying the results of such an analysis to any individual producer, it is necessary to consider other factors, some commercial and some intangible. For example, high prices under a long-term contract may enable an otherwise unprofitable producer to operate quite profitably when spot market prices are low. Also, a strategic commitment to the uranium business could induce a uranium producer to continue operating an unprofitable facility, hoping for an eventual turnaround in market prices.

This Report presents Nuexco's latest estimates of the distribution of uranium production costs for US and non-US producers. Figure 1 displays the results of Nuexco's regression analysis on US uranium production in 1982 as a cumulative (or integral) function of forward costs of production. Figure 2 displays the corresponding results for non-US production of uranium in 1982.

The results shown in Figures 1 and 2 are based on Nuexco's estimates of forward costs of uranium production for each of the operating production facilities participating in the commercial uranium market. This article will discuss the definition and the methods Nuexco used to collect cost data and make the estimates.

Definition

Forward cost of production is a relatively simple concept, but is often difficult to understand. In general, the forward cost of production is *that minimum cost where a producer would experience zero cash flow as a limit*. Since production facilities included in this analysis are currently operating, forward costs of production include only the *variable* costs of production, where variable is defined in the classic accounting sense.

Forward costs *exclude* depreciation, amortization, interest charges and other recoveries of past investments (usually called "sunk costs"). Since forward costs do not include the recovery of sunk costs, forward costs must be less than the total costs of production.

The determination of forward cost of production can be complicated by the wide variety of:

1. Ore body locations and configurations;
2. Environmental and infrastructure conditions;
3. Mining and milling processes;
4. Royalty and severance tax obligations;
5. Marketing and other overhead cost allocations;
6. Cost accumulation and accounting treatments.

Nuexco has defined the *variable* forward cost of production by specifying, for each type of costs, which are included and which are excluded. (If this analysis took into account production centers not yet operating, their forward costs would include some of the costs excluded from *variable* forward costs.)

The *variable* forward cost of production is defined as follows:

1. Included are exploration and development costs associated with mining requirements over the next year. Excluded are all costs of past exploration and development. Also excluded are those current costs associated with mining requirements beyond one year's time.

2. Included are mine stripping costs associated with mining requirements over the next year. Excluded are all "sunk" stripping costs. Also excluded are those current mine stripping costs associated with mining requirements beyond one year's time.

3. Included are all variable costs of mining, hauling and milling operations, such as required labor and materials to sustain and maintain normal operations.

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Figure 1

URANIUM PRODUCTION COST DISTRIBUTION: US

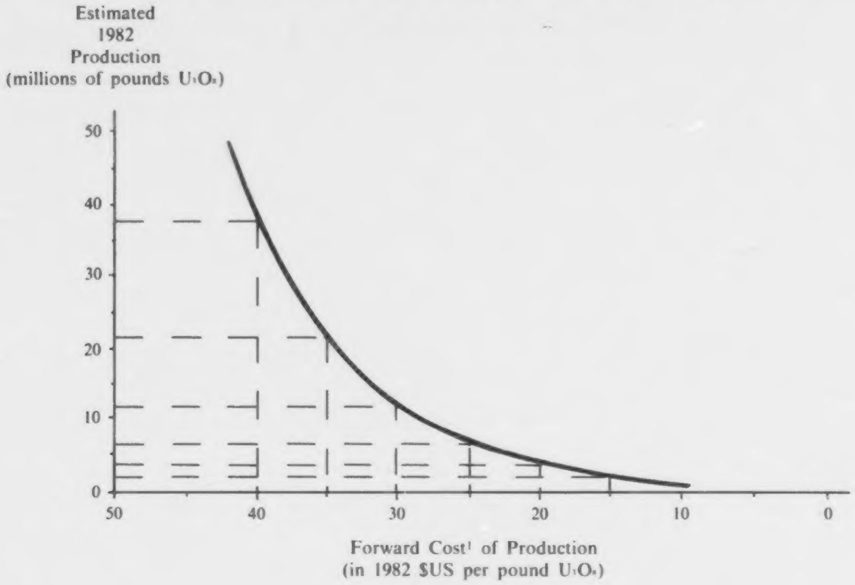
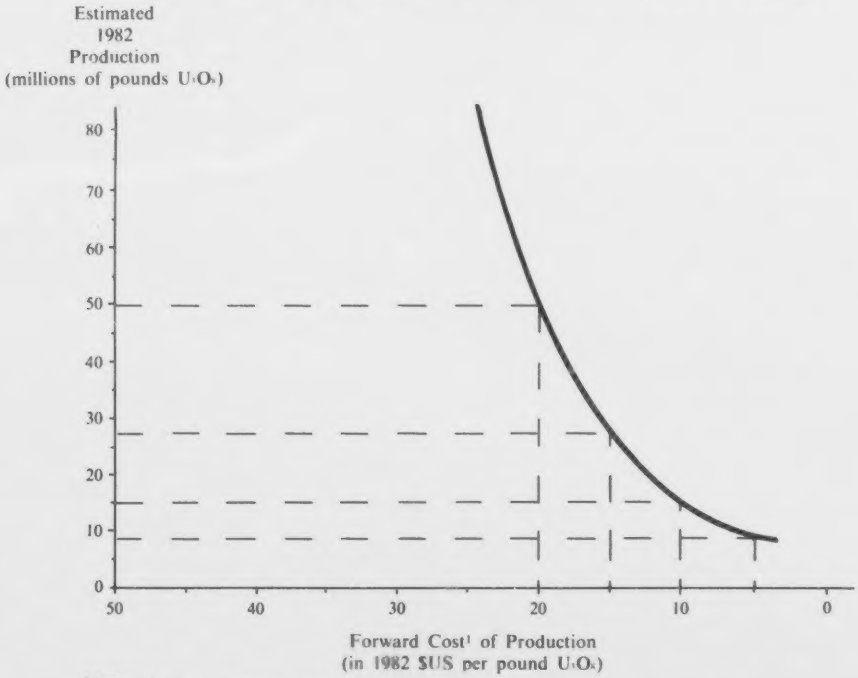


Figure 2

URANIUM PRODUCTION COST DISTRIBUTION: NON-US[2]



[1] Defined in the accompanying text.

[2] Africa, Australia and Canada: Africa includes Gabon, Namibia, Niger and the Republic of South Africa.

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Excluded are depreciation, amortization, interest on capital and other fixed costs associated with prior investment.

4. Included are costs of operating and maintaining tailings ponds associated with waste storage over the next year. Excluded are all "sunk" tailings pond investment costs and all reclamation costs of mine, mill and tailings pond beyond one year's time.

5. Included are royalties, severance taxes and other fees associated with sustaining normal operations. All costs of maintaining an infrastructure in remote areas are excluded.

6. Included are all marketing costs and variable administrative costs associated with the mining/milling function. Excluded are all fixed administrative costs, including all home office or corporate costs. (Many administrative costs have both variable and fixed cost components which must be segregated.)

7. Included are the normal recovery of minimum capital cost expenditures needed to sustain current operations, but recovery of all "sunk" investments, income taxes and return on investment are excluded.

Methodology

Nuexco cost estimates were not prepared at the level of detail outlined in the definition. They were estimated with the definition in mind and were then evaluated in the context of the detailed outline.

Nuexco has endeavored to obtain the most reliable production cost data available to use for the regression analysis. Some producer cost data came from the public record; some producers have furnished cost data to Nuexco for use in industry studies. With these cost benchmarks, Nuexco personnel and Nuexco representatives in the producing countries have evaluated the individual producers' costs. The cost results were then tested by contracting with the best available expert consultants in several countries to perform independent studies. The results of those external studies were then integrated into the latest Nuexco estimates.

The individual cost estimates likely have a higher *relative* accuracy than *absolute* accuracy. Therefore, the results of this analysis should be more useful as an indicator of trends than as a predictor of the behavior of any individual producer.

Interpretation of Results

Figure 1 shows how much US production from currently active producers can be achieved as a function of a given forward cost of production. The horizontal axis represents variable forward production costs, expressed in 1982 US dollars per pound U_3O_8. The vertical axis represents the estimated quantity of uranium to be produced in the US this year at a variable forward cost of production *less than or equal to* the cost indicated at any point on the curve (i.e., Figure 1 is an integral, or cumulative, cost distribution).

From the expected 1982 US production of about 26 million pounds U_3O_8, some 24 million pounds U_3O_8 can be produced at a forward cost level of $36 per pound U_3O_8 or less. On the other hand, only 12 million pounds U_3O_8 can be produced at a forward cost level of $30 per pound U_3O_8 or less.

Taking the analysis one step further, when the Exchange Value was $32 in May 1980, equivalent to about $36 in mid-1982 dollars, those US producers in operation in 1982 could produce about 24 million pounds U_3O_8 with positive cash flow *if all sales were in the spot market*. Currently, with the Exchange Value below $20, those same producers can produce less than four million pounds U_3O_8 with positive cash flow *if all sales were in the spot market*. The above statements, of course, are theoretical and should not be quoted out of context; US production is expected to be over 26 million pounds U_3O_8 in 1982, even though the Exchange Value has been below $23.50 per pound U_3O_8 so far this year. This is practical because US producers are mostly supplying material under long-term contracts at higher average prices.

Figure 2 shows these same relationships for currently active uranium producers in Africa, Australia and Canada; Africa includes Gabon, Namibia, Niger and South Africa. For example, the expected 1982 production from these six countries of more than 70 million pounds U_3O_8 can be produced at a forward cost level of about $23 per pound U_3O_8 or less. Some 30 million pounds U_3O_8 can be produced at a forward cost level of about $16 per pound U_3O_8 or less. Currently, with the Exchange Value below $20, these same producers can produce about 50 million pounds U_3O_8 with positive cash flow *if all sales were in the spot market*. Again, these statements are theoretical and should not be quoted out of context. Non-US producers are better able to compete in the present spot market, but most also have the benefit of long-term contracts at higher prices to support their operations.

In using the variable cost in the make-versus-buy decision, the uranium producer is comparing the price to purchase with the real savings to be attained if produc-

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tion is cut. From a purely quantitative standpoint, a producer should be inclined to cut production to the extent that its incremental cost of purchasing concentrates to supply existing contracts is less than its incremental variable cost of producing those concentrates.

The cost of the purchasing option may include more than the purchase price of the concentrates, however. If a mine is to be completely shut down, for example, the cost of taking it off line and maintaining it thereafter must be included in the purchase option. In addition, some mining leases require that, if there is no production from the leased property, certain payments must be made to the lessors, or the lease may be terminated. These payments must also be included in the cost of the buy option.

While the quantitative aspect of the make-versus-buy decision can often be reduced to a single number, or at least a set of numbers, the qualitative aspect is far more difficult to assess. There are numerous intangible factors that must be considered in determining the outcome of the produce versus procure question.

Qualitative factors favoring the continuation of production include

1 A slowdown or shutdown of work may mean the loss of skilled labor.

2 It is not possible to shut down a wet mine entirely without losing it.

3 The producer might not have the contractual right to substitute purchased concentrates under its supply contract. That is, the existing supply contract might require production from a certain ore body. However, if the spot market price is substantially below the producer's variable cost of production, the producer might benefit by renegotiating its contract with its customer to allow for substitution of purchased material, with some mechanism provided for sharing of savings between the producer and the customer.

4 There may be some difficulty in obtaining suitable concentrates on short notice. This might appear improbable given the large worldwide commercial inventories of uranium. However, these inventories are physically located at UF_6 conversion facilities, for the most part. It may, therefore, be difficult to transfer material in the form of concentrates to uranium producers wishing to purchase on short notice.

5 Some mining leases are subject to forfeiture if there is no production from the leased property.

Qualitative factors promoting the purchase option include:

1 Purchasing during a down market would enable a producer to conserve its reserves for a later time when the price might be higher.

2 Uncertainties regarding precipitous changes in environmental, health, and safety legislation, and severance taxes would be mitigated by the purchase option.

3 The producer's anticipated production rate may be insufficient to meet existing obligations.

These and other qualitative factors will normally go into the make-versus-buy decision, along with the quantitative factors. The relative effect of these intangible factors will vary in impact and magnitude and many times will be the critical factor that determines whether it is best for the producer to adopt a procurement policy, or to continue producing.

The make-versus-buy decision will probably not be a one-time decision, but will often be a continuous decision-making function. Changes may occur from time to time which will shift the balance. The spot market price of uranium may change, production costs, especially variable costs, change frequently, and the intangible factors are in a constant state of flux.

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RAW MATERIALS

URANIUM EXPLORATION METHODS

The Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD) and the International Atomic Energy Agency (IAEA) of the United Nations jointly sponsored an international symposium on uranium exploration methods in Paris, France June 1-4. It was the first such meeting dedicated solely to uranium exploration methods to be sponsored by the international body. About 220 participants from 38 countries attended the symposium.

The NEA and IAEA established in 1976 a joint group of experts from 15 countries to review R & D in uranium exploration techniques. The group recognized an immediate need for the continued development of new uranium exploration technology. Through a collective effort, the group established working projects on an international level covering nine areas of primary concern, listed below:

1. Uranium Exploration Case Histories
2. Uranium Favorability by Mineral Analyses
3. Gases in Uranium Exploration
4. Improvements in the Measurements of Natural Gamma Radiation
5. Borehole Logging
6. Uranium in Granites
7. Recognition of Uranium Provinces
8. Biogeochemical Exploration for Uranium
9. Non-radiometric Subsurface Methods in Uranium Exploration

The purpose of the symposium was to review the exploration process and evaluate the achievements of R & D projects before a scientific gathering. Sixty papers were presented in the process of establishing the objectives of each program, including the evaluation and successes of applied technology to date and the potential for scientific and technical improvements in exploration technology. In keeping with 1976 objectives, the joint group maintains that there should be a continuous effort toward the discovery of additional uranium deposits which will be required to support the nuclear power industry in the twentieth century.

The number of uranium deposits discovered during the relatively short history of the uranium industry (dating back to 1950) is testimony to the successful development and application of early exploration techniques, which of course form the basis for today's R & D activities. Applied geology (and luck) has led to a number of ore discoveries; however, most discoveries are the result of the proper application of innovative exploration technology. Continual improvement in the measurement of natural gamma radiation is perhaps the most important product of on-going R & D. The widespread and varied application of radiation detection technology has been a significant factor in the majority of discoveries. Geochemical and biogeochemical prospecting and the detection of gases associated with uranium also have been important contributors to uranium discoveries.

R & D continues in all of these areas, but advanced exploration technology will be needed to locate the deeper and widely distributed ore deposits of the future. Of special interest is the improved use of alpha and gamma spectrometry for direct analyses of uranium, radium and other decay products in ores and associated rocks. Continued R & D in this area could result in the ability to measure the products of uranium separately and quantitatively in a variety of on-site environments.

Additional R & D projects in an advanced stage of laboratory development include a borehole probe to measure the presence of uranium by x-ray fluorescence. Using this method, the concentration of uranium vs. depth was accurately measured under actual field conditions. Another borehole measurement technique utilizes magnetic susceptibility logging to show low-grade anomalies as well as alteration patterns within the rock, either of which may indicate a nearby uranium deposit. The use of aeromagnetic radiometers to determine the depth of possible ore is in the early stages of field application. Modest success has been achieved to date; continued R & D could lead to a workable exploration tool within the near future. Finally, R & D continues on methods to accomplish the basic recognition of uranium provinces through landsat imagery, geochemical and biogeochemical prospecting and by analysis of the distribution of uranium in various geologic environments.

The basic processes of R & D for uranium exploration technology are still in place and progressing. However, due to the state of the general economy, the slow development of nuclear power generation, and the large uranium reserves known to exist throughout the Free World, support for R & D is beginning to wane.

Financial contributions from government agencies and private industry are falling short of requirements necessary to sustain the R & D programs. This fact is well illustrated by the fact that US DOE eliminated the

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NURE program as of September 1981, and further by the fact that US industry is taking a passive interest in exploration activities and exploration technology. Only two US producers were present at the Paris symposium.

With the decline of US scientific contributions to exploration R & D, Great Britain, France, Canada, South Africa and Australia will assume the leadership role. It is an interesting paradox that the US, after about 30 years as the leader in almost every aspect of the nuclear industry, is now gradually assuming a secondary role, especially in the development and application of exploration techniques.

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STATISTICAL DATA

EXCHANGE VALUE $19.25/lb. U_3O_8
Determined as of June 30, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of June 30, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
21.50	2.6	11	4

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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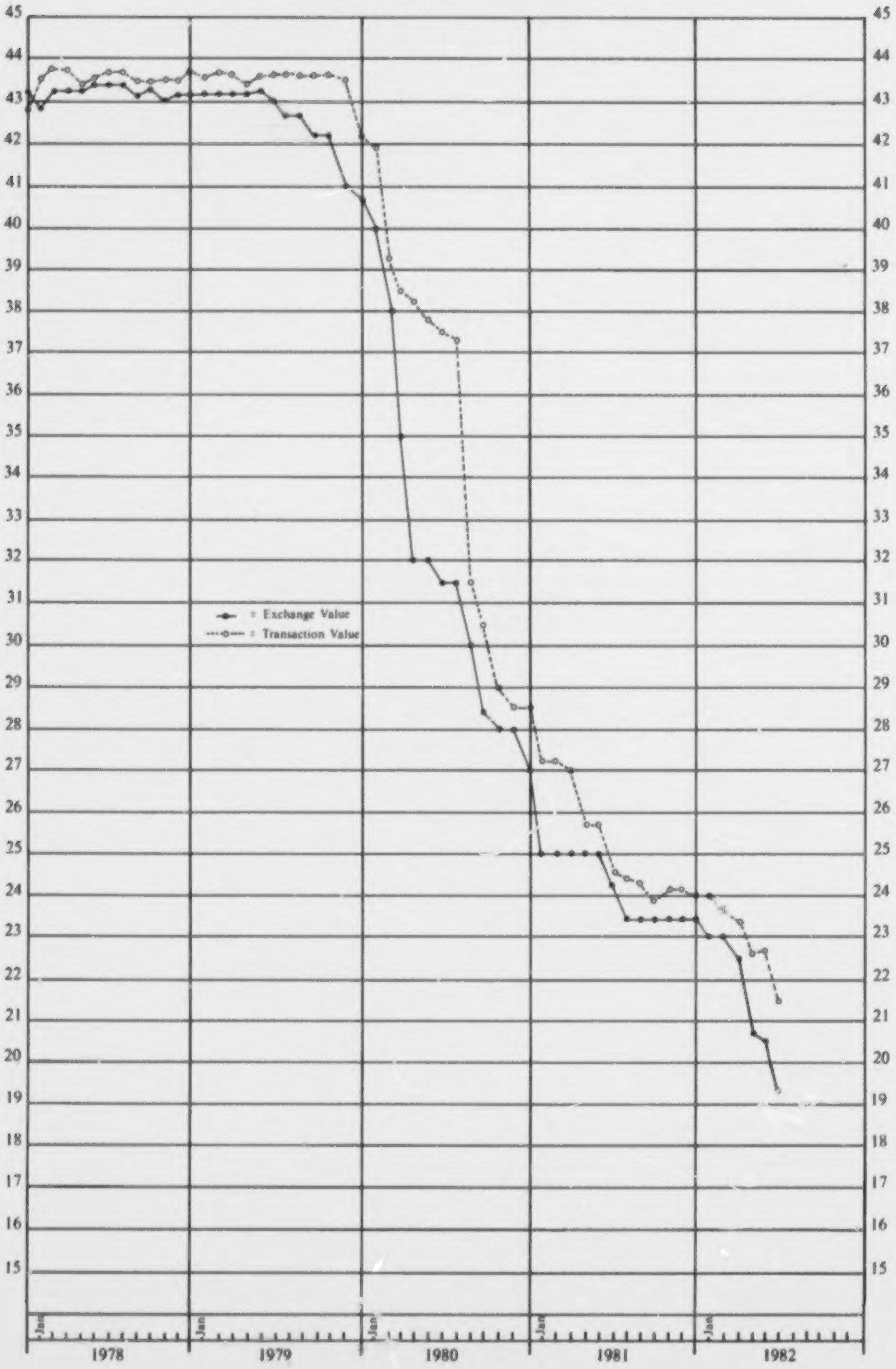
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25						

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50						

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	19.25	42.44	50.05
France (franc)	131.13	289.09	340.91
FRG (mark)	47.30	104.27	122.96
Japan (yen)	4,936	10,882	12,832
Switzerland (franc)	40.35	88.95	104.90
UK (pound)	11.07	24.40	28.78
Australia (dollar)	18.89	41.64	49.11
Canada (dollar)	24.98	55.08	64.95
Niger, Gabon (CFA)	6,548	14,435	17,022
South Africa (rand)	22.07	48.66	57.38
Sweden (kroner)	118.03	260.20	306.84

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.00/lb. U as UF_6
Determined as of June 30, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of June 30, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00
Annual Avg. 1981	355.3R	237.27R
Jan 1981	357.8	230.58
Feb 1981	356.6	230.41
Mar 1981	355.2	229.66
Apr 1981	354.6	229.38
May 1981	353.4	237.31
Jun 1981	360.4	237.93
Jul 1981	356.9	237.86
Aug 1981	359.9	237.86
Sep 1981	357.4	237.82
Oct 1981	351.6	239.26
Nov 1981	350.3	241.13
Dec 1981	348.9	258.01
Jan 1982	353.9	259.76
Feb 1982	355.8	259.38R
Mar 1982	359.4	259.38R
Apr 1982	—	258.91P

P = Preliminary   R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Annual Avg. 1981	—	12.02	9.03	9.53
Apr 1981	267.9	11.73	8.76	9.33
May 1981	270.0	11.80	8.90	9.49
Jun 1981	272.3	11.80	9.16	9.57
Jul 1981	274.3	11.92	9.20	9.62
Aug 1981	276.2	11.83	9.15	9.63
Sep 1981	276.9	12.47	9.22	9.77
Oct 1981	279.3	12.78	9.35	9.91
Nov 1981	278.8	12.89	9.45	9.89
Dec 1981	280.0R	12.87	9.42	10.03
Jan 1982	281.9R	13.04R	9.53	10.11R
Feb 1982	283.3R	13.25R	9.60P	10.19P
Mar 1982	284.5R	13.31P	9.62P	10.34P
Apr 1982	286.5P	—	—	—
May 1982	288.5P	—	—	—

P = Preliminary   R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	700,375	257,173
Feb 1982	—	220.2	236.8	705,992	250,191
Mar 1982	45.49	225.2	237.4	—	—
Apr 1982	—	228.9	241.9	—	—
May 1982	—	230.3	244.8	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.
[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."
[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
[4] April 1970 = 100.00.
[5] Bulletin of Statistics, Department of Statistics, Pretoria.
[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.55R	11.98R	9.12	7.62R
Jun 1981	305.1	294.5	271.3	191.06	11.29R	11.90R	9.07	7.56R
Jul 1981	306.2	296.0	274.4	—	11.60R	12.21R	9.16	7.65R
Aug 1981	307.2	296.2	276.5	—	11.84R	12.10R	9.19	7.73R
Sep 1981	307.4	295.7	279.3	195.61	12.10R	12.70R	9.38	7.75R
Oct 1981	309.0	296.1	279.9	—	12.08R	12.44R	9.37	7.80R
Nov 1981	309.3	295.9	280.7	—	12.12R	12.48R	9.42	7.83R
Dec 1981	310.0	295.8	281.5	200.10	12.08R	12.45R	9.53R	7.90R
Jan 1982	311.8R	298.3R	282.5	—	12.19R	12.66R	9.68	7.98R
Feb 1982	311.4P	298.5P	283.4	—	12.22R	12.61R	9.68	7.96R
Mar 1982	311.0P	297.9P	283.1	201.99R	12.29R	12.69R	9.71R	8.01R
Apr 1982	309.9P	297.9P	284.3	—	12.26P	12.65P	9.79P	8.03P
May 1982	309.5P	298.6P	287.1	—	—	—	9.77P	8.08P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
	(Referenced to May 31, 1982)		
Exchange Value[1]	19.25	20.50	24.25
Transaction Value[1]	21.50	22.70	24.50
Conversion Value[2]	1.00	1.00	1.15
Loan Use Charge Rate[3]	6%	6%	5½%
Near-Term Uranium Supply[4]	17.8	15.2	5.2
Near-Term Uranium Demand[5]	1.1	1.6	1.0
Near-Term Supply-Demand Ratio	16.2	9.5	5.2
Optimum Tails Assay[6]	.327	.318	.285
Current Transactions[7]:			
Number of Transactions	6	2	4
Quantity of Material[8]	0.4-1.2	0.2-0.6	1.0-2.1

---

[1] US $ per pound U_3O_8 equivalent
[2] US $ per pound U as UF_6
[3] Percent per annum
[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6] Percent U_{235}
[7] Uranium transactions only; does not include loans or conversion transactions
[8] Millions of pounds U_3O_8, equivalent

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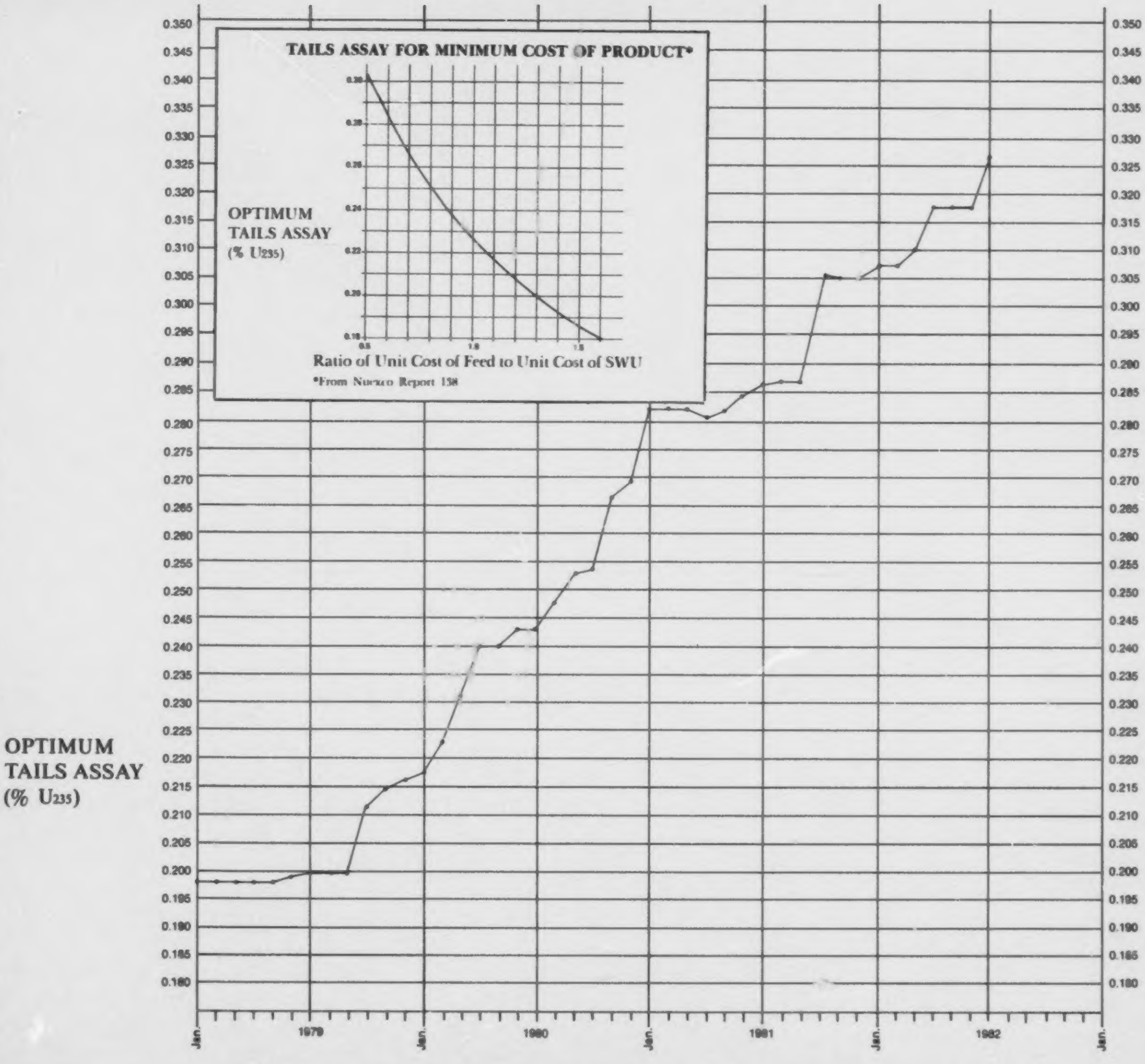
OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE 1980 AFC SWU price; interpolated to the nearest thousandth.

STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Co., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas
FIFO:	First in, First out
LIFO:	Last in, First out

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NUEXCO REPORT 167
EXECUTIVE SUMMARY

Exchange Value Drops $1.25, to $19.25

The **Exchange Value** as of June 30, 1982 is $19.25 per pound U_3O_8. Sellers continued their vigorous competition for the limited business available in the current market.

Near-Term Supply Increases and Near-Term Demand Declines

Active sellers in the zero to one year time frame are offering 17.8 million pounds U_3O_8, up 2.6 million pounds from last month. *Active* uranium demand in the zero to one year time frame decreased by more than 30%, to only 1.1 million pounds U_3O_8.

Supply-Demand Imbalance Aggravated

Consequently, the ratio of near-term supply to near-term demand increased dramatically from 9.5:1 last month to 16.2:1 this month.

Transaction Value Declines $1.20 to $21.50

The **Transaction Value** as of June 30, 1982 is $21.50 per pound U_3O_8. It includes eleven transactions totaling 2.6 million pounds U_3O_8 and covers a period of four months. **NOTE:** Last month's Executive Summary contained an error in the Transaction Value. It should have reported the Transaction Value as of May 31, 1982 as $22.70, *not* $20.70. Please replace the incorrect copy of June's Executive Summary with the corrected copy enclosed in this Report.

Six Uranium Sales Reported

Six uranium sales are reported this month. The total quantity falls in the range of 400 thousand to 1.2 million pounds U_3O_8.

Conversion Value Unchanged at $1.00

The **Conversion Value** as of June 30, 1982 is $1.00 per pound U as UF_6, unchanged from last month. No conversion transactions are reported. Active sellers are offering 4.5 million pounds U in near-term conversion services, while active demand amounts to only 300 thousand pounds U in near-term conversion services.

Key Lake Partners Reportedly Made Several New Sales

Canadian sellers' success in tough marketing environment attributed to their willingness to respond to market realities. Nuexco expects selling pressure to ease somewhat, now that much of future output has been committed for sale.

Production Cost Distributions Presented

The *Market Analysis* section includes graphs of Nuexco's estimates of the distribution of US and non-US uranium production vs. forward costs of production.

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NUEXCO

AUGUST 1982 NUMBER 168

Monthly Report on the Uranium Market

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NUEXCO

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NUEXCO

MONTHLY REPORT ON THE URANIUM MARKET

August 1982 No. 168

R. WESLEY MILLER, *EDITOR*

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FOREWORD

Please note that USDOE will not be holding a Uranium Industry Seminar (customarily held annually in Grand Junction, Colorado) this year.

NUEXCO

August 1982
#168

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of July 31, 1982 is $18.25 per pound U_3O_8, down $1.00 from last month's level of $19.25. This decline reflects the continued spirited competition for the few sales opportunities for spot and near-term delivery. As has been the case recently, US utilities liquidating unwanted inventories were the major market factor on the sell side, although some producers were also active.

In last month's Report, *Active* sellers were offering more than 17 million pounds of U_3O_8 or equivalent UF_6 for sale. Of that amount, roughly half was offered by a single seller who, during July, entered into negotiations involving most of that material and subsequently decided to withdraw the remainder from the market, pending a review of his overall situation. Other sellers were shifted to the *Inactive* category, based on their unwillingness to offer competitive prices. As a consequence of these changes, the ratio of active near-term supply and demand dropped sharply from 16.2:1 a month ago to 2.6:1 this month.

Current buyers include US producers who have elected to buy rather than make, as well as some utilities motivated by the opportunity to acquire material at what they apparently view as bargain prices. Some US utility buyers appear to be of two minds with respect to the current price declines. On the one hand, they express concern about producer shutdowns and the future of the US uranium production industry. On the other hand, they note their obligation to acquire uranium at the lowest possible price, and their inability to justify to their managements or ratemaking bodies the higher prices that producers view as necessary to maintain a viable US industry.

It should be noted that such spot and near-term procurement, if continued, will help redistribute the excess inventories being offered for sale, and provide the basis for eventual price recovery. However, it must also be observed that such redistribution will delay the time when utilities need to make new long-term supply commitments. This delay, in turn, puts increased pressure on existing producers, particularly those whose current delivery commitments are nearing completion.

The **Transaction Value** as of July 31, 1982, is $20.30 per pound U_3O_8, down $1.20 from a month ago. The current Transaction Value includes 10 transactions totaling 2.2 million pounds U_3O_8 and covers a period of 4 months. The *Market Data* section lists 6 transactions this month.

* * *

The **Conversion Value** as of July 31, 1982, is $1.00 per pound U as UF_6, unchanged from last month. Offers to sell conversion services in the near term are well in excess of demand. The market remains quiet with one transaction under negotiation and a few other situations in the early stages of discussion.

* * *

The **Loan Use Charge Rate** remained at six percent. Activity in the loan market is minimal with one large transaction under negotiation and a few smaller transactions in the preliminary phases of discussion.

AFRICA

Second quarter 1982 production figures from South Africa gold-uranium operations are presented in Table 1.

Table 1

**REPUBLIC OF SOUTH AFRICA:
Production from Gold-Uranium Operations;
Second Quarter 1982**

Operation	Thousands of Pounds U_3O_8
Beisa (St. Helena)	133
Blyvooruitzicht	153
Buffelsfontein	320
CHEMWES	280
Dreifontein Consolidated	125
ERGO	141
Harmony	326
Hartebeestfontein	229
J.M.S.	490
Randfontein	231
Vaal Reefs	983
Western Areas	100
Western Deep Levels	95
TOTAL:	3,606

Second quarter production increased by approximately two percent over first quarter production.

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MARKET ACTIVITIES

Nuexco Report 165 showed total first quarter production from gold-uranium operations of 3.4 million pounds U_3O_8. Production figures for the Beisa section of St. Helena were not included in the total because they had not yet been released. A production total of 122,000 pounds U_3O_8 has since been announced to bring actual first quarter production to over 3.5 million pounds U_3O_8.

First half 1982 uranium production of about seven million pounds U_3O_8 is consistent with Nuexco's total 1982 production forecast of over 15 million pounds U_3O_8. Overall production during the second quarter 1982 was down about ten percent from the same period of 1981.

The slight production increase over first quarter 1982 levels is mainly due to substantial increases from Vaal Reefs and Western Areas which offset production declines from several other facilities. Overall, most of the gold-uranium producers experienced slight drops in uranium output during the second quarter.

Uranium production at Blyvooruitzicht showed about a seven percent decline from first quarter levels because of a drop in the grade of ore mined. Reduced tonnage from higher grade areas caused decreases in gold grade as well. Blyvooruitzicht has less flexibility to high-grade than most mines, as its higher grade carbon leader ore reserves are being depleted and it is restricted to long wall mining.

J.M.S. production decreased from a first quarter level of 591,000 pounds U_3O_8 because of reduced amounts of slime treated in the uranium plant. Randfontein experienced a small decrease in production levels as a result of plant modifications. Randfontein production for the second half of 1982 will probably exceed that of the first. First half production was just under half a million pounds U_3O_8.

CHEMWES second-quarter production decreased about 20 percent largely due to lower ore grades and a reduction of tons treated.

The Beisa section of St. Helena continued to be hampered by intersections of water and underground geological faulting, although production was slightly higher in the second quarter. The situation is expected to improve as the section reaches full production levels.

The largest production gains during the second quarter came from Vaal Reefs and Western Areas. As anticipated, the problems at the Vaal Reefs South Uranium plant have been overcome and the plant is now operating at its designed capacity. The amount of material treated increased nearly 20 percent. With a five percent rise in ore grade, the net result was a 30 percent production increase during the quarter.

Because of the depressed market, mining of uranium reserves by Vaal Reefs in the Afrikander lease area has been suspended. The uranium section of the metallurgical plant will be kept on a maintenance (stand-by) basis after its scheduled completion in the third quarter of this year.

A seventy percent increase in uranium production from Western Areas was due to selective mining on the middle Elsburg Reef Horizon. While the amount of ore treated was down 25 percent, a 129 percent increase in ore grade resulted in the substantial production gains.

AUSTRALIA

The Australian Labor Party (ALP) has recently modified its policy on uranium mining and export in anticipation of the next Federal election, eighteen months away. The complicated and seemingly contradictory language of the new policy allows various interpretations. The one certainty is that the new policy is destined to be no less controversial than the old.

One part of the text reiterates the party's commitment to end uranium mining; another section casts it in terms of an option. In other places the policy falls back into hard-line rhetoric stating that the ALP would allow no new uranium mine development to commence while forming the new government.

Anti-nuclear groups and anti-nuclear party members have labeled the new policy a "nuclear sell-out." They see the ALP's commitment to end uranium mining in Australia reflected in the old platform but not in the new. Even more moderate party supporters have publicly expressed their disdain over the change, although on first reading, the amended policy strongly reaffirms the ALP's opposition to nuclear power and uranium mining.

Senior ministers of the present government have predicted that the new policy would destroy the uranium industry and prevent new export contracts if it were implemented by a Labor government. Thus, the new policy has both caused a rift within the ALP and prompted pre-election posturing by the current government.

The policy would seem to allow existing uranium production to continue while "phasing out" Australian involvement in uranium mining. But it sets conditions which the industry will find almost impossible to meet.

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For example:

1. For any export contract with a French customer, an ALP government would require that France cease all nuclear testing in the Pacific.

2. Any contract for uranium export to Japan would only be considered subject to the Japanese "withdrawing from their intention to dump waste material in the Pacific."

The policy stipulates similarly specific conditions for Finland (no diversion of nuclear material to the USSR); the United Kingdom (no diversion of Australian uranium for military use); and West Germany (no further supply of nuclear technology and equipment to Argentina). The text concludes that the principles of the conditions will be applied to sales contracts for uranium from existing mines with any other country, should the circumstances warrant such a move.

Supporters and opponents of the amendment appear to agree on one point: irrespective of the formidable obstacles the policy raises in terms of the market, the significant point is the freedom given the ALP on the issue. The party is no longer bound to repudiate export contracts and to close uranium mines if elected to power.

The new policy could be construed as paving the way for a change in ALP thinking. This view is supported by one provision stating that an ALP government would consider applications for exports of uranium mined incidentally with other minerals. This point would cover mines such as Roxby Downs where uranium is found in association with copper and gold.

Undoubtedly, the ALP's moderate leadership realizes that uranium mining is no longer a central moral issue for the majority of Australian voters. The present government harshly condemns the ALP's anti-uranium stance in the firm belief that uranium mining and export has the support of most Australians. The ALP's previous hard-line policy was unattractive to the party's leadership, not the least because of the immediate and serious effects its implementation would have on international relations. The new policy can be seen as evidence that the ALP is slowly coming to terms with the reality of uranium mining in Australia.

In the meantime, Australian uranium sales forces will be busy persuading potential buyers against becoming prejudiced towards Australian supply. Their task is difficult. The wording of the new ALP policy may be "too clever" for even the most internationally minded foreign utility.

* * *

Australia's Federal government has given final approval to the Jabiluka development. The Northern Territory government may now grant a mining lease to the joint venture partners (Pancontinental Mining Ltd. 65 percent, and Getty Oil Development Co. 35 percent). The lease is initially valid for 42 years. This announcement follows last week's formal signing of the agreement between the partners and the Aboriginal Land Council on the terms and conditions under which the project can proceed.

* * *

The Roxby Downs copper/gold/uranium deposit is estimated to contain far larger quantities of those minerals than previously assumed. According to figures released by Western Mining (51 percent owner), the estimated amounts of mineralization drilled on a 200 meter grid are: 2000 million tonnes at an average of 1.6 percent copper; 0.6 Kg/tonne of uranium oxide; and 0.6 grams/tonne of gold, commencing 350 M below the surface. Simple arithmetic would convert these figures into the following:

Mineralization (million tonnes)	**Copper (million tonnes)**	**U_3O_8 (million lbs.)**	**Gold (tonnes)**
2000	32	2832	1200

The above figures are staggering. The deposit could contain six times the copper reserves of Australia's largest copper mine at Mt. Isa and twice as much uranium as all known Australian uranium deposits and estimated additional resources combined.

The significance of this deposit is its sheer size. However, its relatively low grade requires a large scale underground operation in order to be viable. Uranium sales will be critical to its viability. Under the indenture bill, the feasibility study for Roxby Downs must be completed by 1984 and a decision to proceed reached three years later.

EUROPE

In **Spain**, Iberduero has decided to separate into a new sub-group the 2.2 billion dollars worth of fixed assets it has tied up in the troubled Lemoniz plant. If the plant were to be written off as a loss, Iberduero would be able to obtain tax relief as part settlement in respect of losses from the stoppages at and damages to the plant. It is still likely that the Spanish state or the Basque government will be persuaded to take over Lemoniz. The first of the twin 930 MWe units was due to begin operation next year, but that timetable is questionable at this point.

* * *

In **Belgium**, EBES (Sociétés Réunies d'Energie du Bassin de l'Escaut) connected Doel Unit 3 to the grid on June 23. Ordered at the end of 1974, Doel Unit 3 is a PWR of 900 net MWe.

* * *

In **France**, the Taipower President, Mr. Chen Lan-Kao, has declared that negotiations are in progress between Taipower and the French authorities on the storing and reprocessing of spent fuel and waste from Taiwan's American supplied reactors. Other governments are also being contacted.

* * *

In other French developments, low power testing has begun at the 900 MWe Blayais Unit 2. Blayais Unit 1 came into service in May 1981, and Units 3 and 4 are expected to come onstream next year.

On June 26, EdF received official authorization to build Cattenom Units 3 and 4 in the Moselle. Also, the General Council of Loire-Atlantique has pronounced in favor of the Carnet site, 50 kilometers west of Nantes, rather than the site of Rohars. The government will make the final decision between the two sites. EdF put forward the names of these two sites after the local populace rejected the Pellerin site because it was only 35 kilometers from Nantes.

* * *

Agreement in principle was announced by Mr. Edmond Herve, Minister of Energy, to build a plant at Civaux. The initial project involved four units, but this has been reduced to two because the local Information Commission was concerned about the water problems which might ensue from having four units on the site. The public inquiry will be launched in September or October, work should start in 1985, and the plants could be scheduled to come onstream as early as 1991.

The local Information Commission has voted in favor of building Nogent-Sur-Seine Units 3 and 4 in the Aube. the Aube.

There will be a meeting this fall presided over by the Minister of Energy to review the reports given by the local Information Commissions on sites where it is proposed to build plants of over 1000 MWe.

FAR EAST

Taipower, the national utility of **Taiwan**, recently announced its government's decision to defer indefinitely the construction of planned Nuclear Units 7 and 8. Units 7 and 8 would have been required if Taiwan's load growth had proceeded as forecast. However, the generally depressed economic conditions have led to lowered forecasts of electric power demand. The deferral of these two units does *not* imply any change in the basic thrust of Taiwan's nuclear power development plans.

The announcement came as no particular surprise. Nuexco's forecasts of uranium consumption published in Report 164 had already anticipated the deferrals of Taiwan Nuclear Units 7 and 8, so the announcement will have no effect on the Nuexco forecast. However, the deferral of the two units does mean that existing uranium supply contracts will suffice for Taipower's needs until late in the decade.

On June 29, Taipower's Kuosheng Unit 2, a BWR of 951 net MWe, generated its first electricity. It will amost certainly enter commercial operations by the end of this year.

* * *

During July, the **People's Republic of China** (PRC) delivered approximately 65,000 pounds U_3O_8 to Japan's Power Reactor and Nuclear Fuel Development Corporation (PNC). Although China had exported U_3O_8 to other Communist countries before, this delivery was the first PRC export to a non-Communist customer.

It is not yet clear whether this transaction will lead to other commercial uranium dealings between the PRC and non-Communist nations. However, the PRC has previously stated its intention to avoid dealing with South Korea, the USSR, Israel or South Africa, among others.

The material involved in this transaction is scheduled to be converted and enriched at PNC's Ningyo Pass pilot plant and then to be used in mixed oxide fuel for the Fugen test reactor. Because the material was imported for non-commercial use, the transaction was subject to the approval of Japan's Science and Technology Agency. It was also necessary for PNC to obtain an import license from the Ministry of International Trade and Industry (MITI).

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MARKET ACTIVITIES

UNITED STATES

Action taken by three US uranium production companies brought more bad news to the industry.

1. Western Nuclear is suspending operations at both its Ruby Mines in New Mexico and its Sherwood mine and mill in Washington. There will be no further uranium output for the company.
2. Dawn Mining placed its Midnite Mine on standby.
3. Conoco is one of the many major oil companies leaving the mining business altogether and wants to divest itself of its uranium assets. It has one active production operation, its Treviño, Texas *in situ* project.

* * *

Marline Uranium had the mixed blessing of finding 30 million pounds of 0.20 percent average grade uranium in southern Virginia, potentially recoverable using open pit mining methods. The company is evaluating development plans, but under current market conditions, it appears unlikely Marline will be able to bring the find into production in this decade.

* * *

Two nuclear utilities had welcome news this month.

1. Middle South Utilities' Grand Gulf Unit 1, now conducting low power testing, has a good chance to enter commercial operations this year.
2. Just before press time, the NRC voted unanimously to grant a full power operating license for San Onofre Unit 2, managed by Southern California Edison (SCE). SCE's minority partners are San Diego Gas and Electric and two California municipalities, Riverside and Anaheim. The granting of the license is conditional on the utilities' submission, by July 1, 1983, of a study for installing new valves for the purpose of emergency cooling. San Onofre Unit 2, which had already had a fuel loading and low power license, achieved initial criticality on July 26, 1982, and is expected to enter commercial operations this year.

Earlier in the month, the NRC's Atomic Safety and Licensing Board (ASLB) had authorized full power licenses for both San Onofre Unit 2 and Unit 3. SCE expects to receive a fuel loading and low power operating license for San Onofre Unit 3 this year or early next year. If that timetable is met, Unit 3 could enter commercial operations sometime in 1983.

* * *

Public Service of New Hampshire (PSNH) continues its struggle to complete Seabrook Unit 2 on schedule in 1986. New Hampshire's Utilities Commission advised the utility several months ago to stop constructing the unit, at least until Seabrook Unit 1 is finished, indicating it doubts PSNH is capable of handling the financial burden of both units. PSNH has not taken action to comply with the request, so the commission recently announced it will not allow the utility to use funds obtained through public offerings for construction of Seabrook Unit 2. In a report presented to Congress in March of this year, Seabrook Unit 2 was one of 19 nuclear units having construction permits which the NRC staff projected would be cancelled or indefinitely deferred. If construction is stopped, the unit will be very vulnerable to cancellation.

* * *

The US and India have resolved a four-year dispute over fuel for India's two-unit Tarapur power station. Under the terms of the new agreement, announced July 29, the US will allow India to use uranium obtained from France to fuel the two American-built units at Tarapur. The agreement is subject to India's observance of IAEA safeguards. The US has not granted India permission to reprocess the resulting spent fuel; India would need US permission to remove the spent fuel from the reactor site.

The dispute was triggered by India's detonation of a nuclear weapon in 1974. The US had agreed in 1963 to supply the enriched UF_6 necessary to operate Tarapur from its startup in 1969 through 1993. However, concerned that India could, by reprocessing the spent fuel from Tarapur, obtain the plutonium necessary for another bomb, in 1978 the US suspended deliveries of nuclear fuel under the terms of the Nuclear Non-Proliferation Act. The US also attempted to use political pressure to induce India to accept IAEA safeguards.

* * *

Nuexco has completed a review, similar to the NRC staff review released in March and discussed in Nuexco Report 164, of US nuclear plants with construction permits. The last such Nuexco reactor analysis was published in Nuexco Report 160 as an essay explaining Nuexco's interpretation of the impact of nuclear reactor cancellations in the United States. That essay analyzed those units officially cancelled between June 1979 and

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June 1981 as well as those units Nuexco projected would be cancelled beyond June 1981.

This most recent Nuexco review of US reactors under construction or on order reached the conclusion that the stream of nuclear unit cancellations has neither stopped nor slowed appreciably. The units Nuexco now expects to be eventually cancelled represent substantial investments by the affected utilities; they were reported as anywhere from four percent to 50 percent complete as of December 31, 1981 (Nuclear News World List of Nuclear Power Plants).

The units summarized in Table 2 were previously included in Nuexco's Apparent Future Consumption calculations; they have not been included in any prior discussion of units Nuexco expected to be cancelled. The estimates of cancelled capacity as well as the lost demand are based on past Nuexco forecasts of commercial operating dates and reactor consumption.

Nuexco's latest forecast, as shown in Table 2, calls for the cancellation of eleven reactors now under construction or on order. Those units represent approximately 15 gigawatts of lost generating capacity between 1989 and 1995. More significantly, uranium demand lost if the forecast is realized will amount to more than 30 million pounds U_3O_8 between 1987 and 1995. More than 16 million pounds U_3O_8 in lost demand would fall in the years from 1987 to 1991.

Table 2

IMPACT OF FORECAST CANCELLATIONS

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Cancelled GWe	0	0	0	0	0	0	0	1.1	3.2	1.3
Cumulative Cancelled GWe	0	0	0	0	0	0	0	1.1	4.3	5.6
Lost Annual Demand (millions of pounds U_3O_8)	0	0	0	0	0	0.9	3.4	2.4	6.3	3.7
Cumulative Lost Demand (millions of pounds U_3O_8)	0	0	0	0	0	0.9	4.3	6.7	13.0	16.7
Demand as reported in Nuexco Report 164	21.3	28.2	28.5	31.4	36.0	35.6	37.1	38.2	37.7	36.1
Adjusted Demand	21.3	28.2	28.5	31.4	36.0	34.7	33.7	35.8	31.4	32.4

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Sale:			
ACTIVE			
1575		500 per year	Long Term
1818		250 per year	Long Term
1845	160		
1900	1,150		some UF_6
1925	500		UF_6
1961	60		
1970	70		UF_6
1973	450		
1976	180		
TOTAL:	2,570		
INACTIVE			
1581B		150 per year	Long Term
1610	150		
1664	100		
1774	50		
1804	615		
1805		500 per year	Long Term
1810		750	
1814	250		
1877	50		
1920	3,000		
1932	300		
TOTAL:	4,515		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Loan:			
ACTIVE			
1742	500		
1815	1,000		
1884	275		
1919	3,000		
1931	600		
1932A	1,000		
1938	2,000		
1939	800		
TOTAL:	9,175		
INACTIVE			
1910	1,000		
TOTAL:	1,000		
Inquiries to Borrow:			
ACTIVE			
1780	260		
TOTAL:	260		
INACTIVE			
1621	300		
TOTAL:	300		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	 Beyond 1 Year	Remarks
Inquiries to Purchase:			
ACTIVE			
1638		300 per year	1984-89
1842		500 per year	2,000 Total
1843	320	250	
1871		250 per year	1983-86
1915		500	UF_6
1933	160		
1945		500	
1964		500	
1969	50		
1975	60		
1977	450		
TOTAL:	1,040		
INACTIVE			
1410		1,500 per year	5,000 Total
1459		200 per year	Long Term
1652		200 per year	Long Term
1888		500 per year	Long Term
1923	30		
1935		400	
1963		180	
1966	100	200	
TOTAL:	130		

[1] Measured from the date of this Report.

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MARKET DATA

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF₆) 0 to 1 Year	Beyond 1 Year	Remarks
ACTIVE			
1584	550	300 per year	Long Term
1607	600		
1609	500	1,500 per year	Long Term
1886	500		
1925	450		
1936	200	200 per year	Long Term
TOTAL:	2,800		
INACTIVE			
1619		300	
1840	300		
1902		350	
TOTAL	300		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF₆) 0 to 1 Year	Beyond 1 Year	Remarks
ACTIVE			
1594	400		
1622	250	700	
TOTAL:	650		
INACTIVE			
1594		450 per year	Long Term
TOTAL:	0		

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[1] Measured from the date of this Report.

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller	Buyer	Remarks
1849	1982	less than 50	111	US Producer	Canadian Utility	
1850	1983-90	1001-2000	96	Canadian Producer	US Utility	
1853	1982	301-600	99	US Utility	US Utility	
1867	1983	301-600	99	US Producer	US Producer	
1870	1982-87	301-600	97	US Producer	US Utility	
1873	1982	less than 50	93	US Producer	US Producer	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller	Buyer	Remarks

There are no conversion transactions reported this month.

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[1] Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.

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MARKET ANALYSIS

ESTIMATED URANIUM PRODUCTION AND CONSUMPTION: 1970-1980

Introduction

This Report presents Nuexco's estimates of historical uranium production and consumption for the years 1970-1980. Historical consumption is a theoretical calculation of the actual burnup of uranium in each reactor core in the WOCA countries, with time allowed for the processing of the required uranium through the front end of the fuel cycle. In this context, uranium consumption is defined as:

The calculated U_3O_8 requirements entering the U_3O_8/UF_6 conversion plant to account for the subsequent burnup achieved in the reactor core at a later time.

Methodology

Historical uranium consumption is calculated as a function of:

1. Specific core characteristics of each reactor.
2. Actual tails assay levels which applied to each period of diffusion plant operations.
3. Actual gross electricity generation from each reactor in the period.
4. Annual refueling.
5. Twenty-four month lead time for initial cores and twelve month lead time for reload fuel.

For example, the U_3O_8 equivalent of calculated uranium burnup in each reactor's *initial* core load was moved forward two years from time of initial electrical generation to allow for processing time from the U_3O_8 form and for start-up testing. Also, the U_3O_8 equivalent of calculated uranium burnup associated with each reactor's annual (assumed) *refueling* was moved forward one year from time of restart to also allow for processing time. No allowance for inventory accumulation or depletion appears in the consumption data.

In order to estimate uranium consumption in accordance with the definition stated above, it was first necessary to compile data on the amounts of electricity generated by each reactor in the relevant period. Those results are summarized in Table 3, by broad geographical region. Table 4 shows the same results for each country within the region.

Results

The results of Nuexco's estimates of uranium consumption are summarized in Table 5, by broad geographical region. Table 6 shows the same results for each country within the region.

The nuclear power generation data in gross terawatt-hours for each nuclear plant (excluding the fast spectrum nuclear plants) for each year were converted into uranium burnup values using appropriate physics and fuel exposure data. Use of the annual generation data effectively includes the actual capacity factor of each plant for each year. Annual refueling was assumed for this time period because it was the predominant refueling interval. Tails assay levels for the enrichment plants were based on the actual levels utilized in each period of diffusion plant operation.

Historical production data for the significant uranium producers in the WOCA countries are shown in Table 7. This data has been compiled from the most reliable sources available, but excludes minor production from Belgium, Brazil, India, Japan, West Germany and similar countries.

Limitations of Estimates

1. Some caution must be exercised in comparing the above results with other historical data published by Nuexco. For example, Table 5's consumption estimate for the years 1979 and 1980 differs somewhat from estimates of Apparent Future Consumption for those same years published in earlier Monthly Reports. This difference is largely due to the assumption herein that U_3O_8 held in storage for future first core usage by nuclear plants long delayed in construction is not included; that material has not been consumed in the reactor to generate power. The earlier Nuexco Reports do include that first core material in the estimated consumption in cases where the delays occur less than two years before forecast dates of commercial operation.
2. The calculation herein has certain limitations in that it does not allow for any deficiency in attaining target fuel exposure and, hence, burnup in each initial core and reload. In the early years of commercial nuclear power development, some quantities of fuel were discharged before reaching target burnup due to fuel performance failures. Also, fuel physics and fuel exposure data used in the above calculation may have differed somewhat from that used in actual core loads due to the frequent "last-minute" changes in enrichment levels and refueling patterns that dominated this period of plant operation.

Analysis and Implications

Table 8 presents a comparison of historical commercially-utilized WOCA production and consumption of uranium. Table 8 reflects the events of the years 1970-1980.

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MARKET ANALYSIS

Table 3

NUCLEAR GENERATION OF ELECTRICITY: 1970-1980
(Total Gross Terawatt-hours or Millions of Megawatt-hours)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Europe	42.7	55.9	68.3	72.6	80.1	110.2	125.2	153.0	158.9	177.9	179.7
Far East	5.2	7.2	8.6	4.6	15.9	18.4	35.0	32.6	55.9	70.2	89.1
Other Nations	0.9	10.2	13.4	16.2	19.5	18.8	24.3	31.5	38.3	44.0	46.4
United States	12.1	34.0	62.3	84.5	119.4	178.3	199.0	255.3	287.8	266.4	260.9
TOTAL:	60.9	107.3	152.6	177.9	234.9	325.7	383.5	472.4	540.9	558.5	576.1

Table 4

NUCLEAR GENERATION OF ELECTRICITY[1]: 1970-1980
(Thousands of Megawatt Hours)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Europe											
Belgium	0	0	0	0	121	6,763	10,011	11,673	12,490	11,370	9,740
Finland	0	0	0	0	0	0	0	0	0	3,585	4,432
France	5,272	9,593	14,048	14,174	13,674	16,893	14,729	26,109	29,212	44,861	48,527
West Germany	6,207	5,667	7,936	11,229	10,666	21,672	24,524	35,807	32,476	35,459	41,826
Italy	3,315	3,355	3,635	3,142	3,410	3,800	3,797	3,383	4,428	2,627	2,209
Netherlands	368	405	526	1,038	3,349	3,335	3,872	3,710	4,060	3,489	4,200
Spain	1,007	2,440	4,751	6,545	7,223	7,544	7,555	6,525	7,649	6,700	5,185
Sweden	0	60	1,417	2,054	2,038	12,021	15,992	19,890	23,781	21,039	24,086
Switzerland	0	1,903	4,915	6,192	6,863	7,721	7,900	8,070	8,349	11,848	8,672
United Kingdom	26,524	32,443	31,101	28,238	32,717	30,467	36,842	37,805	36,491	36,875	30,858
Europe TOTAL:	42,693	55,866	68,329	72,612	80,061	110,216	125,222	152,972	158,936	177,853	179,735
Far East											
Japan	5,173	7,229	8,595	4,562	15,944	18,356	35,029	32,525	50,915	60,683	77,755
Korea	0	0	0	0	0	0	0	0	2,324	3,152	3,177
Taiwan	0	0	0	0	0	0	0	99	2,670	6,329	8,199
Far East TOTAL:	5,173	7,229	8,595	4,562	15,944	18,356	35,029	32,624	55,909	70,164	89,131
Other Nations											
Argentina	0	0	0	0	1,036	2,517	2,572	1,637	2,895	2,692	2,340
Canada	919	10,247	7,552	14,285	15,410	13,242	18,016	26,764	32,925	38,383	40,372
India	0	0	5,624	1,936	2,475	2,514	3,194	2,779	2,264	2,924	2,842
Pakistan	0	2	233	0	584	546	487	338	229	35	839
Other Nations TOTAL:	919	10,249	13,409	16,221	19,505	18,819	24,269	31,518	38,313	44,034	46,393
United States	12,117	33,967	62,307	84,481	119,422	178,260	198,963	255,253	287,772	266,411	260,905
Free World TOTAL:	60,902	107,311	152,640	177,876	234,932	325,651	383,483	472,367	540,930	558,462	576,164

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[1] McGraw-Hill, Inc.; New York, N.Y.; "Nucleonics Week"

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Table 5

ESTIMATED URANIUM CONSUMPTION: 1970-1980
(Millions of Pounds U_3O_8 Equivalent)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Europe	10.3	6.6	8.5	13.2	13.5	15.0	17.6	19.8	21.9	26.5	35.7
Far East	0.9	0.6	3.5	1.9	3.9	2.0	9.6	5.7	3.7	4.8	8.5
Other Nations	0.6	0.7	0.8	0.8	1.0	1.6	1.6	1.9	2.0	2.4	3.7
United States	7.0	9.8	17.0	12.8	13.0	18.3	17.3	16.0	18.9	21.1	20.7
TOTAL:	18.8	17.7	29.8	28.7	31.4	36.9	46.1	43.4	46.5	54.8	68.6

Table 6

ESTIMATED URANIUM CONSUMPTION
(Thousands of Pounds U_3O_8)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Europe											
Belgium	0	0	0	1,739	0	423	630	726	777	713	2,696
Finland[1]	0	0	0	0	0	0	0	864	0	217	1,132
France[2]	1,485	1,094	1,576	1,592	1,587	2,763	4,379	3,645	7,036	10,257	8,047
Italy	426	399	458	370	419	464	1,644	423	525	290	241
Netherlands	38	545	54	82	231	234	270	258	283	245	292
Spain	1,412	313	473	619	699	726	721	669	716	1,542	1,444
Sweden	950	0	1,045	1,882	1,463	1,390	1,353	1,838	3,375	4,346	3,617
Switzerland	976	114	928	1,843	1,776	2,182	2,202	3,126	2,312	2,514	2,659
United Kingdom[3]	2,840	3,745	3,442	3,075	5,891	3,304	4,022	4,884	3,893	4,177	10,612
West Germany	2,180	404	529	1,963	1,469	3,540	2,391	3,407	3,001	2,196	4,013
Yugoslavia	0	0	0	0	0	0	0	0	0	0	898
Europe TOTAL:	10,307	6,614	8,505	13,165	13,535	15,026	17,612	19,840	21,918	26,497	35,651
Far East											
Japan	842	585	3,474	1,904	3,862	1,969	8,299	5,052	3,382	4,299	6,533
Korea	0	0	0	0	0	0	631	0	132	179	562
Taiwan	0	0	0	0	0	0	641	641	158	377	1,456
Far East TOTAL:	842	585	3,474	1,904	3,862	1,969	9,571	5,693	3,672	4,855	8,551
Other Nations											
Argentina	0	0	102	0	69	169	172	110	194	180	157
Brazil	0	0	0	0	0	0	0	0	0	0	203
Canada	534	507	372	706	761	1,272	1,182	1,591	1,619	1,904	2,941
India	0	148	380	132	173	175	221	191	155	292	347
Pakistan	91	0	13	0	32	30	26	18	12	2	46
Other Nations TOTAL:	625	655	867	838	1,035	1,646	1,601	1,910	1,980	2,378	3,694
United States[4]	7,038	9,815	16,996	12,807	12,961	18,294	17,344	15,964	18,968	21,060	20,727
Free World TOTAL:	18,812	17,669	29,842	28,714	31,393	36,935	46,128	43,407	46,538	54,790	68,623

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[1] Excludes 2 Russian Reactors

[2] Excludes Phoenix, Creys-Malville

[3] Excludes Dounreay

[4] Excludes Shippingport & Hanford

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MARKET ANALYSIS

1. Substantial inventory accumulation occurred in the early 1970s, when utilities and other users were building inventories with low-priced material.
2. In the mid-1970s, consumption and desired inventory buildup were rising without comparable expansion of production, such that inventory accumulation was limited and prices were rising.
3. In the latter part of the period, production was again well in excess of consumption and desired inventory buildup, and prices fell to less than half their prior peak levels.

Table 8 can be summarized with cumulative totals (in millions of pounds U_3O_8):

Cumulative production,	1970-1980	733
Cumulative consumption,	1970-1980	422
Inventory accumulation,	1970-1980	311

That inventory amount compares with a 1981 WOCA beginning inventory of 368 million pounds U_3O_8 published in Report 159. The difference is largely attributable to inventory on hand at the beginning of 1970, although certain changes in assumptions in the theoretical calculation of consumption in the Nuexco model may also account for some portion of the difference.

Table 7

WOCA URANIUM PRODUCTION: 1970-1980
(Millions of Pounds U_3O_8)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Argentina	0.12	0.12	0.07	0.12	0.13	0.06	0.10	0.26	0.33	0.31	0.49
Australia	0.66	0	0	0	0	0	0.93	0.93	1.34	1.83	4.06
Canada	9.16	9.96	10.40	9.65	8.89	9.13	12.6	15.05	17.69	17.80	18.58
France	3.26	3.26	3.59	3.94	4.19	4.50	4.87	5.45	5.68	5.95	6.85
Gabon	1.04	1.40	0.55	1.05	1.13	2.08	2.51	2.36	2.66	2.86	2.69
Namibia	0	0	0	0	0	0	1.70	6.08	7.01	11.02	10.50
Niger	0	1.12	2.26	2.60	3.25	3.40	3.80	4.19	5.36	9.20	10.73
Portugal	0.17	0.15	0.19	0.19	0.24	0.30	0.23	0.25	0.25	0.30	0.21
South Africa	8.23	8.37	8.00	7.11	7.05	6.47	7.17	8.74	10.30	12.50	15.98
Spain	0.13	0.16	0.16	0.17	0.16	0.35	0.44	0.47	0.50	0.52	0.52
United States	25.8	24.6	25.8	26.5	22.9	23.1	25.5	29.9	36.9	37.6	43.7
TOTAL:	48.6	49.1	51.0	51.3	47.9	49.4	59.8	73.7	88.0	99.9	114.3

Table 8

WOCA URANIUM PRODUCTION VS. CONSUMPTION: 1970-1980
(In Millions of Pounds U_3O_8 Equivalent)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Production[1]	49	49	51	51	48	49	60	74	88	100	114
Consumption[2]	19	18	30	29	31	37	46	43	46	54	69
Addition to Inventory	30	31	21	22	17	12	14	31	42	46	45

[1] This Report, Table 7 (rounded to nearest million).
[2] This Report, Table 5 (rounded to nearest million).

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URANIUM RESOURCES

Introduction

Steadily rising production costs and declining market prices have combined to reduce Nuexco's estimate of Free World reasonably assured resources (RAR) from approximately 1,450,000 tonnes U_3O_8 in July 1981 (Report 155) to 636,000 tonnes U_3O_8 as of this Report. A reduction was to be expected, but the magnitude of reduction outlined in this Report might come as a surprise to some. The current estimate is less than 44 percent of that published thirteen months ago.

Methodology

The Nuexco estimate of RAR published in Report 155 was based on the definitions accepted by the International Atomic Energy Agency (IAEA) and the Organization for Economic Cooperation and Development (OECD). RAR are defined by IAEA/OECD as:

> "uranium that occurs in known mineral deposits which can be recovered within a production cost range of less than US \$30 per pound U_3O_8, with currently proven mining and processing technology."

The IAEA/OECD further defines RAR as having a high assurance of existence within the specified cost range. RAR so classified are considered as ore reserves, which is consistent with the USDOE classification for ore reserves.

Declining market prices have called into question the generally-accepted IAEA/OECD cost interval of less than \$30 per pound U_3O_8. Therefore, Nuexco has reevaluated, based on procedures accepted by the IAEA/OECD, Free World RAR available at a forward production cost below US \$20 per pound U_3O_8. Both IAEA/OECD and USDOE define forward production cost as:

> "all capital and operating expenditures incurred after the date of the ore reserve estimate. Sunk costs are not included."

By either definition, a substantial percentage of uranium resources known to exist in the Free World could not be produced profitably at current price levels. However, that is not to say that higher cost production will not continue to be available. For example, under such special circumstances as favorable forward sales contracts or government sponsored production programs, production operations having average costs double or triple current market price can sometimes continue to operate profitably.

The current Nuexco estimate yielded a sharp decrease of reserves in every uranium resource country except South Africa. In all cases, however, uranium resources have shifted into higher cost categories according to ore grade and newly assigned recovery economics. The estimate of less than \$20 by Nuexco is considered to be a reasonable cost cutoff for RAR even though the market level is currently lower. The primary influence over present market activity is inventory selling. Only a limited number of existing producers will be able to sustain production under such circumstances, especially in the US. Present production capability will diminish rapidly and planned production centers could be delayed indefinitely. The duration of the situation is uncertain; therefore, RAR at a cost of less than \$20 per pound may become the accepted level where property development and marketing activity will stabilize during the period of uncertainty.

Table 9 presents the Nuexco estimate of RAR available at a forward cost cutoff of \$20 or less per pound U_3O_8. The estimate for the four principal uranium resource countries of Australia, Canada, South Africa and the United States is primarily based on public information. Nuexco has used its best judgment to adjust the RAR to the \$20 forward cost category. An RAR summary for the rest of the Free World is included in the table; however, the estimated RAR is considered to be less reliable by Nuexco due to the scarcity of available information. Table 9 also shows, for comparison, the IAEA/OECD estimate of RAR as of January 1, 1981. The Nuexco estimate for the Free World is less than half that of the IAEA/OECD.

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Table 9

FREE WORLD URANIUM RESOURCES REASONABLY ASSURED AT FORWARD COSTS BELOW US$20 PER POUND U_3O_8

Country	Nuexco Estimate 7/1/82 (Tonnes U_3O_8)	Percent of Total	IAEA/OECD Estimate 1/1/82 (Tonnes U_3O_8)	Percent of Total
Australia	118,000	19	347,000	26
Canada	142,000	22	271,000[1]	20
South Africa	287,000	45	291,000	21
United States	15,000	2	186,000[2]	14
Subtotal:	562,000	88	1,095,000	81
France	14,000	2	70,000	5
Niger	60,000	10	189,000	14
TOTAL:	636,000	100	1,354,000	100

[1] Measured and Indicated reserves minable at a price below $135/kg U as estimated by the Canadian Department of Energy, Mines and Resources.
[2] US DOE estimate dated 1/1/82; the estimate excludes certain ore deposits in early stages of development planning.

Australia

The majority of uranium resources in Australia have been reclassified by Nuexco into higher cost categories. The Nuexco estimate of 118,000 tonnes U_3O_8 as RAR is approximately one-third of the IAEA/OECD estimate. Government export policies and political uncertainties have contributed directly to project delays and escalating recovery costs. Considering the state of the uranium market in general, and Australian government policies in particular, the potential Australian producer, for all practical purposes, has been priced out of the world market.

The only RAR at below $20 per pound are included in the Ranger and Nabarlek deposits. Both projects are in production and operating at a forward cost level below $20 per pound by Nuexco's estimate. It is doubtful if any other project, including the planned in situ leach projects, could come into the market below $20 considering financial costs plus other uncertainties. The possibility exists that uranium could be produced at competitive levels as a co-product to gold at Jabiluka and to copper at Olympic Dam; however, start-up of either project remains questionable because depressed prices of the companion metals compound the problems connected with uranium.

Canada

Nuexco's estimate of RAR at $20 or less is 142,000 tonnes U_3O_8, 48 percent less than the IAEA/OECD estimate. All RAR are limited to deposits at Cluff Lake, Rabbit Lake, Collins Bay and Key Lake. The deposits are already producing or under development. Each deposit contains high-grade reserves that will be mined by open pit methods. This combination plus favorable governmental policies has allowed each producer to market U_3O_8 based on market-priced contracts with an appropriate floor price, and thereby gain a competitive edge over many existing producers and most potential producers.

All other uranium resources in Canada, including Midwest Lake, are reclassified into higher cost categories. Primarily, the reclassification includes the reserves at Elliot Lake which represents the largest ongoing production capacity in Canada. All mines in the Elliot Lake district are operating above the $20 level. Even so, the mines are scheduled to continue operating to supply approximately 84,000 tonnes U_3O_8 to Ontario Hydro through the years 1980-2020. Remaining RAR throughout Canada to be reclassified includes resources at Beaverlodge, Madawaska and Agnew Lake. Each mine has recently ceased operating due to high costs.

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RAW MATERIALS

Another 5,000 to 10,000 tonnes U_3O_8 in small deposits scattered throughout Canada are also reclassified into a higher cost category.

South Africa

Nuexco's estimate of RAR in South Africa is essentially unchanged at 287,000 tonnes U_3O_8 compared to 291,000 tonnes included in the IAEA/OECD estimate. Approximately 3500 tonnes U_3O_8 associated with Karoo sediments is the only material to be reclassified into a higher cost category. The quartz-pebble conglomerates in the Witwatersrand district remain as the main source of RAR. An estimated 85 percent of uranium available in the $20 or less category is associated with gold in the conglomerates. Tailings in the same district account for another 14 percent. The remaining one percent is being recovered as a by-product to copper at the Palabora operation located in the Northern Transvaal.

The recovery of gold and uranium in South Africa is adapted to low-grade, high volume operations which require efficient, low-cost control. Nuexco's estimate of production costs allocated to uranium is within the band of $20 or less per pound U_3O_8, both for newly mined ore and the recovery from tailings. It is Nuexco's judgment that because South African RAR is associated with the gold, total availability will remain high and South Africa will continue to be one of the largest uranium resource countries in the Free World.

United States

Nuexco's estimate of RAR for the US is based on figures released by the USDOE as of January 1, 1982 as modified by information gained in Nuexco studies of uranium production costs. The RAR figure used by IAEA/OECD is outdated one year. DOE reclassified all RAR in the previously accepted category of $15 or less into the $30 or less category. The new RAR at $30 or less estimated by DOE is 186,000 tonnes U_3O_8 compared to 420,000 tonnes as of January 1, 1981, a decrease of 56 percent. Nuexco's current estimate of RAR at the $20 or less per pound is about 15,000 tonnes U_3O_8, an amount less than ten percent of the latest DOE estimate for the $30 or less category. The US can no longer be considered a major uranium resource country under existing circumstances.

Uranium reserves in the US exist primarily in low-grade deposits. DOE estimates the average grade of ore remaining in the $30 classification at 0.19 percent U_3O_8 compared to 0.21 percent in 1981. The reclassification of RAR into higher cost categories is a product of lower ore grades and escalating production costs. Only a few US producers are competitive in the present uranium market. The majority have been forced to curtail or cancel operations. Others have elected to buy uranium concentrate in the marketplace to fill contracts rather than to continue to produce at a loss.

RAR at less than $20 will continue to decrease, but probably at a slower rate. The effect of additional changes in the market price and escalating production costs will be minimized; however, the added pressure on producers could lead to high-grading certain orebodies. Should high-grading occur, RAR for the US could drop to about 8,000 or 10,000 tonnes U_3O_8 within the next two to three years.

Remaining Free World

France and Niger are the only other countries considered to have RAR in the cost category of less than $20 per pound. Reliability of information is less certain, but Nuexco estimates that France has about 14,000 tonnes U_3O_8 available. Niger has an estimated 60,000 tonnes in the lower cost category. Nuexco computed the current estimate of RAR by first reducing the 1981 estimate by 10 percent to account for escalating production costs and then subtracting actual 1981 production. Nuexco assumed no additional resources were delineated. France produced approximately 2,500 tonnes U_3O_8 in 1981; Niger produced approximately 5,800 tonnes.

The RAR of Namibia and Gabon have been reclassified into a higher cost category for the first time by Nuexco. One year ago RAR at $25 or less per pound totaled 90,000 tonnes for Namibia and 24,000 tonnes for Gabon (see Report 155). Nuexco estimates that production costs of both operations now exceed the $20 category; even so, production will probably continue, since almost all production in each country is committed to long-term, higher-priced contracts.

There are no other countries with important uranium resources that, in Nuexco's estimation, could be produced at a cost of $20 or less per pound U_3O_8. Uranium available to the Free World in the current market environment is, therefore, estimated at approximately 636,000 tonnes U_3O_8. A turnaround in the supply/demand situation for the industry will be necessary before RAR will return to a higher availability level.

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STATISTICAL DATA

EXCHANGE VALUE $18.25/lb. U_3O_8
Determined as of July 31, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

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[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of July 31, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
20.30	2.2	10	4

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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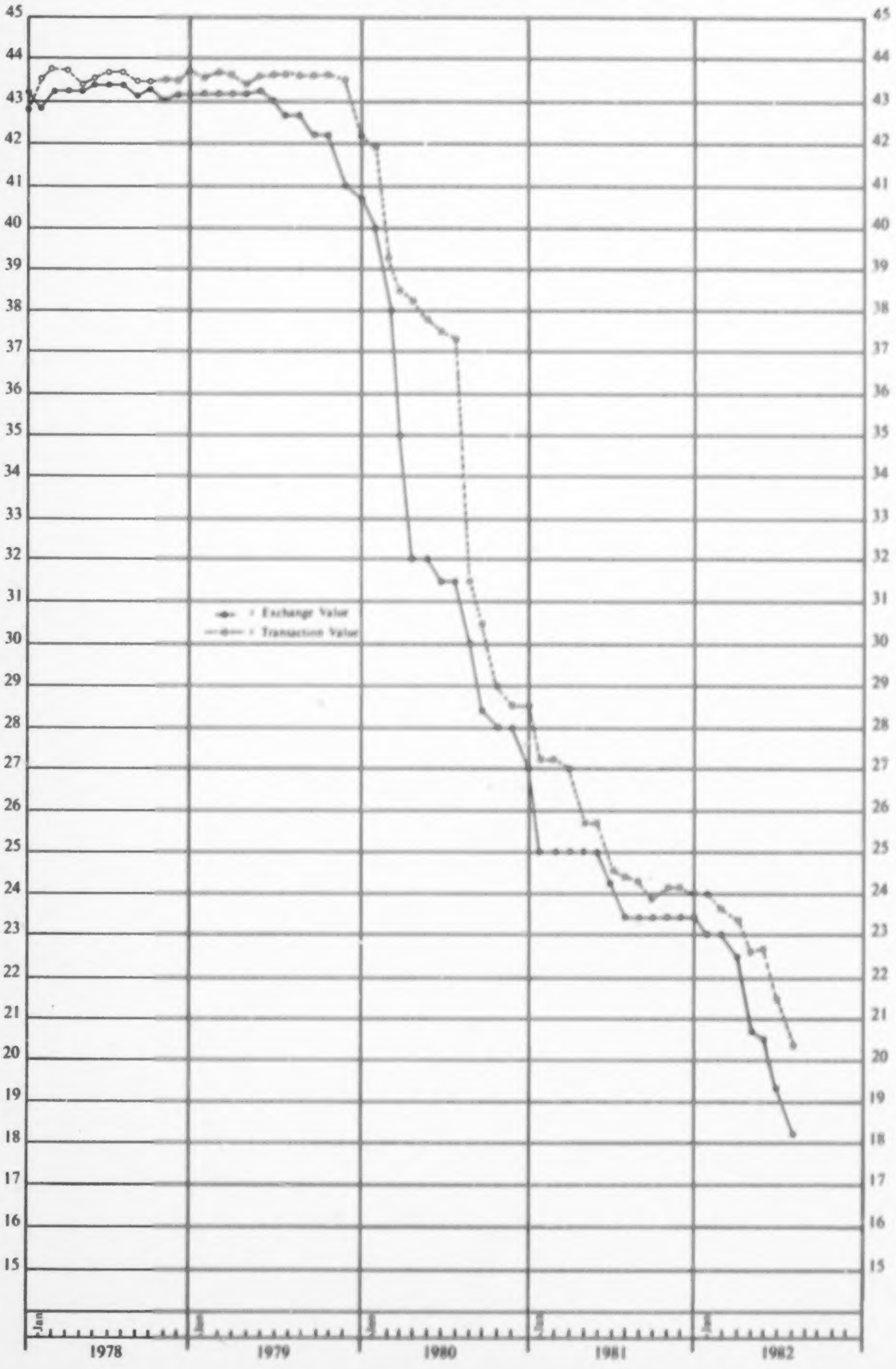
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6,50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25					

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30					

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	18.25	40.23	47.45
France (franc)	124.91	275.39	324.75
FRG (mark)	45.04	99.29	117.09
Japan (yen)	4,704	10,370	12,228
Switzerland (franc)	38.32	84.49	99.63
UK (pound)	10.53	23.21	27.37
Australia (dollar)	18.29	40.32	47.55
Canada (dollar)	23.01	50.72	59.81
Niger, Gabon (CFA)	6,250	13,779	16,249
South Africa (rand)	20.88	46.03	54.29
Sweden (kroner)	110.87	244.44	288.25

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.00/lb. U as UF_6
Determined as of July 31, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of July 31, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00
Annual Avg. 1981	355.3	237.27
Feb 1981	356.6	230.41
Mar 1981	355.2	229.66
Apr 1981	354.6	229.38
May 1981	353.4	237.31
Jun 1981	360.4	237.93
Jul 1981	356.9	237.86
Aug 1981	359.9	237.86
Sep 1981	357.4	237.82
Oct 1981	351.6	239.26
Nov 1981	351.3R	241.13
Dec 1981	349.9R	258.05R
Jan 1982	354.9R	260.05R
Feb 1982	356.7R	259.68R
Mar 1982	360.3R	259.85R
Apr 1982	368.2P	259.38R
May 1982	368.1P	260.06P

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Annual Avg. 1981	272.3P	12.02	9.03	9.53
May 1981	270.0	11.80	8.90	9.49
Jun 1981	272.3	11.80	9.16	9.57
Jul 1981	274.3	11.92	9.20	9.62
Aug 1981	276.2	11.83	9.15	9.63
Sep 1981	276.9	12.47	9.22	9.77
Oct 1981	279.3	12.78	9.35	9.91
Nov 1981	278.8	12.89	9.45	9.89
Dec 1981	280.0	12.87	9.42	10.03
Jan 1982	281.9	13.14R	9.53	10.11
Feb 1982	283.4R	13.25	9.60	10.19
Mar 1982	284.6R	13.34P	9.62P	10.35P
Apr 1982	287.4R	13.42P	9.78P	10.46P
May 1982	288.7R	—	—	—
Jun 1982	289.9P	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	700,375	257,173
Feb 1982	—	220.2	236.8	705,992	250,191
Mar 1982	45.49	225.2	237.4	—	—
Apr 1982	—	228.9	241.9	—	—
May 1982	—	230.3	244.8	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index—Industrial Commodities (1967 = 100)[1]	Producer Price Index—All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.55	11.98	9.12	7.62
Jul 1981	306.2	296.0	274.4	—	11.60	12.21	9.16	7.65
Aug 1981	307.2	296.2	276.5	—	11.84	12.10	9.19	7.73
Sep 1981	307.4	295.7	279.3	195.61	12.10	12.70	9.38	7.75
Oct 1981	309.0	296.1	279.9	—	12.08	12.44	9.37	7.80
Nov 1981	309.3	295.9	280.7	—	12.12	12.48	9.42	7.83
Dec 1981	310.0	295.8	281.5	200.10	12.08	12.45	9.53	7.90
Jan 1982	311.8	298.3	282.5	—	12.19	12.66	9.68	7.98
Feb 1982	311.6R	298.6R	283.4	—	12.22	12.61	9.68	7.96
Mar 1982	311.0P	297.9P	283.1	203.68R	12.29	12.69	9.71	8.01
Apr 1982	309.9P	297.9P	284.3	—	12.23R	12.68R	9.81R	8.03
May 1982	309.5P	298.6P	287.1	—	12.23P	12.68P	9.82P	8.06P
Jun 1982	310.7P	299.4P	290.6	206.35	—	—	9.95P	8.09P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
		(Referenced to July 31, 1982)	
Exchange Value[1]	18.25	19.25	23.50
Transaction Value[1]	20.30	21.50	24.40
Conversion Value[2]	1.00	1.00	1.15
Loan Use Charge Rate[3]	6%	6%	5½%
Near-Term Uranium Supply[4]	2.6	17.8	5.4
Near-Term Uranium Demand[5]	1.0	1.1	1.4
Near-Term Supply-Demand Ratio	2.6	16.2	3.9
Optimum Tails Assay[6]	.333	.327	.286
Current Transactions[7]:			
Number of Transactions	6	6	3
Quantity of Material[8]	1.9-3.9	0.4-1.2	0.5-1.2

---

[1] US $ per pound U_3O_8 equivalent
[2] US $ per pound U as UF_6
[3] Percent per annum
[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6] Percent U_{235}
[7] Uranium transactions only; does not include loans or conversion transactions
[8] Millions of pounds U_3O_8, equivalent

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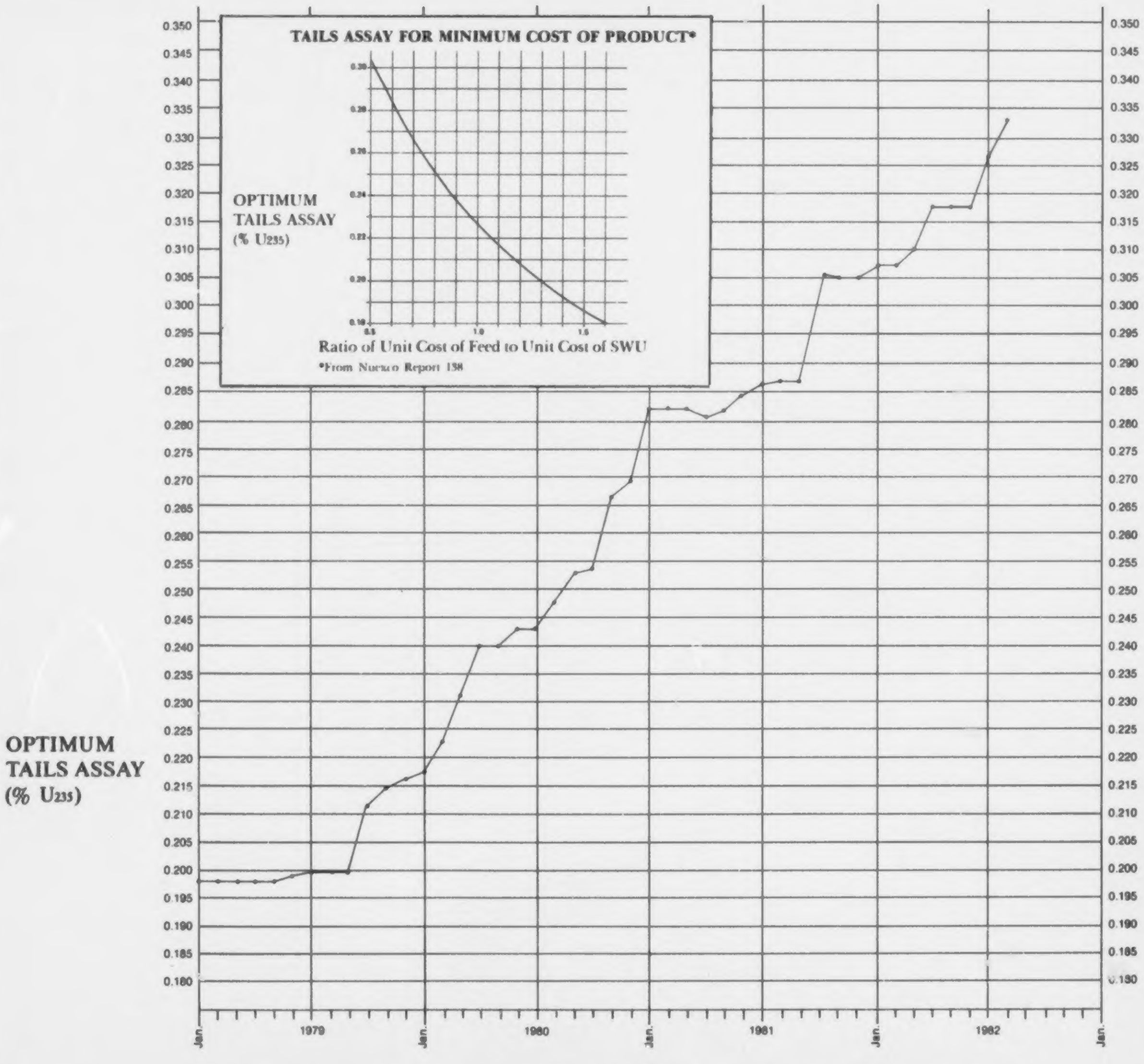
OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

OPTIMUM TAILS ASSAY[1]



[1] Based on Exchange Value and USDOE 1980 AFC SWU price; interpolated to the nearest thousandth.

STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Co., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas
FIFO:	First in, First out
LIFO:	Last in, First out

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NUEXCO REPORT 168
EXECUTIVE SUMMARY

Exchange Value Drops $1.00, to $18.25	The **Exchange Value** as of July 31, 1982 is $18.25 per pound U_3O_8. Sellers continued their vigorous competition for the limited business available in the current market.
Near-Term Supply Decreases Sharply and Near-Term Demand Declines Slightly	*Active* sellers in the zero to one year time frame are offering 2.6 million pounds U_3O_8, down 15.2 million pounds from last month. *Active* uranium demand in the zero to one year time frame decreased slightly, to 1.0 million pounds U_3O_8.
Supply-Demand Imbalance Continued, but Severity Diminished	Consequently, the ratio of near-term supply to near-term demand decreased dramatically from 16.2:1 last month to 2.6:1 this month.
Transaction Value Declined $1.20, to $20.30	The **Transaction Value** as of July 31, 1982 is $20.30 per pound U_3O_8. It includes ten transactions totaling 2.2 million pounds U_3O_8 and covers a period of four months.
Six Uranium Sales Reported	Six uranium sales are reported this month. The total quantity falls in the range of 1.9 million to 3.9 million pounds U_3O_8.
Conversion Value Unchanged at $1.00	The **Conversion Value** as of July 31, 1982 is $1.00 per pound U as UF_6, unchanged from last month. No conversion transactions are reported. Active sellers are offering 2.8 million pounds U in near-term conversion services, while active demand amounts to only 650 thousand pounds U in near-term conversion services.
South Africa	Uranium production in the second quarter of 1982 amounted to 3.6 million pounds U_3O_8, up 2 percent from the first quarter.
Australia	Labor Party softens opposition to uranium mining.
United States	Marline Uranium finds 30 million pound deposit in Virginia.
	Full power license for San Onofre Unit 2.
	Impact of forecast reactor cancellations is assessed.
Market Analysis	Nuexco estimates of uranium production and consumption are presented for the period 1970-1980.
Raw Materials	Rising production costs and declining market prices have combined to reduce Nuexco's estimate of Free World reasonably assured resources from approximately 1,450,000 tonnes U_3O_8 in July, 1981 to 636,000 tonnes U_3O_8 as of this Report.

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SEPTEMBER 1982 NUMBER 169

Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

September 1982 No. 169

R. WESLEY MILLER, *EDITOR*

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FOREWORD

Nuexco is pleased to announce the establishment of our European office. Staffed by Jim Vaughan, Vice President, and Katie Bowen, Regional Marketing Manager, the office will be formally opened as soon as we complete arrangements for office space and communications. In the meantime, any customers in Europe should feel free to contact Jim or Katie by telephone at 33-50-40-85-85. Katie and Jim may also be contacted through our representative in London,

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or our New York office, or our headquarters office in Menlo Park, California.

Nuexco's New York office is now staffed by Ken McCue, Vice President; Scott Hickman, Regional Marketing Manager; and Terry Elms Lindsay, Marketing Representative. Mrs. Lindsay was transferred to New York from California as of August 15.

Enclosed with this Report is a copy of a speech presented by Bob Wolcott at the Uranium Institute annual meeting on September 3, 1982 in London.

NUEXCO

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of August 31, 1982 is $17.00 per pound U_3O_8, down $1.25 from last month's level of $18.25. During August, sellers continued their spirited competition for the few sales opportunities for spot and near-term delivery. US utilities liquidating unwanted inventories continued to participate in the market, but their influence may be waning. Such sellers still account for approximately two-thirds of the *active uranium supply* reported this month, but for only about one-fourth of the material involved in current transactions.

Active sellers are offering 1.7 million pounds U_3O_8 for sale in the near term, down from 2.6 million last month. However, since *active uranium demand* in the same time frame dropped from 1.0 million to only 160 thousand pounds U_3O_8, the supply-demand ratio rose sharply from 2.6:1 last month to 10.6:1 this month. The past three months' wild swings in that ratio (9.5 to 16.2 to 2.6 to 10.6) are the direct result of the market's thinness. Because there are so few active participants in the current market, the actions of one buyer or one seller can have disproportionate effects on the spot and near-term price for uranium. Therefore, the current *unstable* market has the potential for sharp price movements in either direction.

* * *

The *Market Data* section lists 10 uranium transactions this month. Although the market has been characterized for some time by sales from utilities to producers, especially in the US, it is interesting to note that the two largest transactions during August were US utility purchases from producers, one US and the other Canadian.

The importance to the market of utility sales to producers seems to be waning. For the fourth consecutive month, Nuexco has reported no sales from utilities to producers. DOE has reported that, during 1981:

1. Eight US utilities sold 2.8 million pounds U_3O_8 for 1981-1982 delivery;
2. Three US utilities loaned 0.6 million pounds U_3O_8;
3. US producers received approximately 75 percent of the combined total.

Thus, commercial transfers from US utilities to US producers during 1981 involved approximately 2.5 million pounds U_3O_8. So far, during 1982, Nuexco has reported only four sales, and no loans, from utilities to producers. The total quantity falls in the range of 1.1-2.2 million pounds U_3O_8. Those sales all took place in the first quarter of this year.

* * *

The **Transaction Value** as of August 31, 1982, is $19.10 per pound U_3O_8, down $1.20 from a month ago. The current Transaction Value includes 14 transactions totaling 2.3 million pounds U_3O_8 and covers a period of 4 months.

* * *

The **Conversion Value** as of August 31, 1982, is $0.90 per pound U as UF_6, down ten cents from last month. Offers to sell conversion services in the near term are four times demand, 2.6 million to 650 thousand pounds U as UF_6. One conversion transaction closed during the month. Sellers of conversion services have indicated their willingness to sell at prices near the current Conversion Value, but interest on the part of buyers has been limited.

* * *

The **Loan Use Charge Rate** remained at six percent. Activity in the loan market in minimal. One large transaction is under negotiation and a few smaller transactions are in the preliminary phases of discussion.

AUSTRALIA

The federal government has granted a mining lease to Pancontinental Mining Ltd. and its partner, Getty Oil Development Company, Ltd., for the Jabiluka uranium deposit. The project partners now hold mining title to the ore body and are permitted to proceed with mine and mill construction.

* * *

Exploration drilling for the quarter ended June 30, 1982 at the Westmoreland uranium prospect in Queensland amounted to 1646 meters of percussion drilling and 6890 meters of diamond bit drilling in 92 drill holes. The field season will conclude in mid-September and drill results may be known six weeks later. The project is owned by Queensland Mines, Ltd. (40 percent), CSR (12.7 percent), IOL Petroleum (9.8 percent), Urangesellschaft Australia Pty. Ltd. (37.5 percent).

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MARKET ACTIVITIES

The government, as part of its new budget initiative, will spend A$1,000,000 this year for a pilot plant to produce full-sized canisters of Syn-Roc. These funds will be provided to the Australian Atomic Energy Commission (AAEC) and will be in addition to a grant of A$230,000 this year for a Syn-Roc research facility at the AAEC's laboratories.

Syn-Roc is a method, developed in Australia, for the disposal of radioactive waste. It was developed by a research team under Professor Ringwood of the Australian National University, and has been tested for three years at the AAEC's laboratories. The AAEC claims that it has significant advantages over other waste disposal methods, and is up to five hundred times more effective than vitrification. Syn-Roc is reported to maintain its integrity under irradiation and to withstand exposure to high temperature water without releasing significant quantities of radioactivity.

The hope is to manufacture Syn-Roc on a large scale at a commercially attractive cost. The recent grant continues the government's support of this aspect of the nuclear fuel cycle.

* * *

In an address before the Australian Constitution Association, the Minister for Energy, Sir John Carrick, reiterated the official government position that:

1. Australia faces an energy problem unless nuclear power is accepted as an energy source.
2. Despite government plans to conserve coal and oil and its policy of encouraging exploration, nuclear power must eventually play a large part in electricity generation in Australia.

Sir John's remarks should be regarded not as a significant policy move, but as a reaffirmation of a policy that promotes the long-term use of nuclear power. Public support such as this from a prominent government figure is vital to the establishing and maintaining of a climate of public acceptance for nuclear power.

EUROPE

In the **Federal Republic of Germany (FRG)**, two recently issued first-stage construction permits could signal the end of the five-year de facto moratorium on new nuclear construction. In July, the Bavarian Ministry for the Environment issued the FRG's first construction permit in five years to Bayernwerk for Isar Unit 2 sited at Ohu. The most recent had been that issued for Philippsburg Unit 2 in July 1977. Construction has already begun under the new permit. It was followed two weeks later, August 9, by Lower Saxony authorities' issuance of a first-stage construction permit for the Emsland nuclear unit, a 1,222 net MWe PWR sited at Lingen, to the unit's principal owner and operator, Vereinigte Elektrizitaetswerk Westfalien (VEW).

Some hope that the issuance of these two construction permits will be followed by as many as four or five more this year under the federal government's new "convoy" system. However, the next unit in the convoy is Biblis Unit C. Its principal owner and operator, Rheinisch-Westfaelisches Elektrizitaetswerk (RWE), probably will not receive a first-stage construction permit for that unit until late this fall, so the prevailing optimism is tempered by caution.

The convoy system was introduced in February and has been supported strongly by the German reactor construction firm Kraftwerk Union (KWU). The system's proponents hope it will allow the approval of reactor construction permits to take place with regularity. Its fundamental premise is that standard (generic) plant designs, once approved, need not be reviewed individually when used in other reactors under circumstances falling within the design parameters. Under the new system, legal and technical rulings made during license reviews are routinely extended to other cases. The system also speeds the implementation of design changes made after the license is issued.

At present, the FRG has twelve operating reactors, whose capacity totals 9.8 net GWe (gigawatts, electric). With the issuance of the two construction permits, there are ten units under construction, comprising 10.6 GWe. Thus, the reasonably assured nuclear capacity stands at 20.4 GWe. If, as expected, construction permits are granted promptly for several additional units under the convoy system, the FRG could have nuclear capacity of more than 25 GWe in operation by the end of this decade. However, simply reaching 20 GWe by that time would require doubling installed nuclear capacity in eight years, a not inconsiderable achievement.

* * *

In **France**, highlights from the recently released 1981 annual report for the Commissariat a l'Energie Atomique (CEA) are:

1. French mining companies spent 16 percent more on exploration in 1981 than in 1980, approximately 740 million francs or US$ 123 million.

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2. French uranium reserves remained stable at around 140,000 tonnes U_3O_8 as of January 1, 1982.

3. French domestic uranium production totalled 6.6 million pounds U_3O_8 in 1981, down 3 percent from 6.8 million in 1980. Of this amount, 4.9 million pounds are attributable to Cogema and 1.7 million to other companies, notably Dong Trieu and Minatome.

4. Abroad, uranium production from mines in Niger, Gabon and Canada in which French companies have shareholdings was 17.3 million pounds U_3O_8, of which 10.0 million pounds went to France.

In Niger, Somair's total production was 5.5 million pounds U_3O_8. Cominak produced a total of 5.9 million pounds U_3O_8.

In Gabon, Comuf produced 2.7 million pounds U_3O_8.

In Canada, total production from Cluff Lake amounted to 3.4 million pounds U_3O_8.

Highlights from Cogema's just published 1981 annual report:

1. Exploration expenditures declined by 10 percent as compared to 1980, but the program was generally sustained at high levels. Emphasis was shifted slightly, to increase spending on foreign and reduce domestic exploration. There was particular emphasis on Canada and Australia. Abroad, continued effort is being expended in Niger (Imouraren Project in association with Conoco and Onarem), in Gabon (notably with Korea Electric Company), in Mali, Senegal, in Canada (mostly Saskatchewan and Quebec), in the US (Texas), in Australia (Western Australia, South Australia and Queensland), and Guyana.

2. Domestically, Cogema mined 5.5 million pounds U_3O_8, but technical difficulties at the start of the new plant at Lodeve limited combined mill output to 4.9 million pounds.

3. Abroad, Cogema (through its 100 percent subsidiary Coginter) received 6.2 million pounds U_3O_8 from its share of mine production in Niger and Gabon (Somair, Cominak and Comuf) — which was just over 44 percent of their total production. In Texas, Framco, a wholly-owned subsidiary of Cogema, holds 25 percent of the Benavedes in-situ operation which continues to operate satisfactorily.

* * *

In **Spain**, Asco Unit 1 has cleared the last hurdle before fuel loading, startup and power generation. Spain's nuclear regulatory authority, the Consejo de Seguridad Nucleare (CSN) granted the necessary safety certification, so the Ministry of Industry provisionally authorized the unit's principal owner and operator, Fuerzas Electricas de Cataluna, S.A. (FECSA) to start up the 880 net MWe Westinghouse PWR. It is possible that FECSA, in order to avoid the steam generator problems encountered by Almaraz Unit 1, a similar Westinghouse unit, might choose to:

1. Operate the plant at only 50 percent of capacity.
2. Delay startup until Westinghouse decides whether steam generator modifications are required.

* * *

In the **United Kingdom** the CEGB has published the names of five sites for future nuclear power stations.

1. Hinkley Point in Somerset
2. Dungeness in Kent
3. Sizewell in Suffolk
4. Winfrith in Dorset
5. Druridge Bay in Northumberland

No order of precedence has been established, but Hinkley Point will probably be the next site after Sizewell B, for which the Board has already requested planning permission. Whether the reactors ordered for these new sites will be PWRs or AGRs has not yet been specified.

Hinkley Point, Dungeness and Sizewell would involve extensions of existing nuclear power station sites. Some of the other new sites which the CEGB had been investigating were ruled out because of its policy of building at least 2000 MWe of nuclear capacity on any new site.

FAR EAST

The **Japan** Energy Economy Research Institute (JEERI) recently published its long range forecast of power supply. Particularly notable is the nuclear power forecast which differs substantially from previously established official government targets. JEERI forecasts that installed nuclear capacity in 1990 will be 38,000 MWe, constituting about 18 percent of energy supply. This compares to the official targets of 46,000 MWe and 22 percent. For the year 2000, JEERI forecasts 60,000 MWe and 25 percent, as opposed to official targets of 90,000 MWe and 30 percent.

Previous Nuexco Reports have indicated our opinion that the official targets are overly optimistic, given current lead times and siting difficulties. The JEERI forecast substantially agrees with those views. The

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differences between the JEERI forecast and the official targets are of such a magnitude that projecting Japan's future uranium needs must be approached with caution. The range of uncertainty is increased by Japanese plans to use:

1. LWR fuels having higher design fuel burnup;
2. Mixed oxide fuels.

Both actions could reduce uranium demand substantially in this century.

UNITED STATES

Actions of two US uranium producers announced in August will contribute further to the decline in US uranium production in 1982.

1. Plateau Resources will be closing its Ticaboo, Utah mill immediately. At present, Plateau plans to resume full operations in late 1984 to meet contract commitments for 1985 deliveries.
2. Kerr McGee, the largest operating producer in the US, is reducing its Ambrosia Lake and Church Rock, New Mexico operations by about 30 percent.

Nuexco's current forecast of 1982 US uranium production is 25.7 million pounds; when final results are tabulated, the total will probably be lower than that amount. It is Nuexco's opinion that many producers will fall short of the production levels planned at the beginning of this year.

* * *

The US NRC issued a "conditional" full power operating license for Commonwealth Edison's LaSalle Unit 1. The license was conditional on a satisfactory review of workers' complaints of construction defects. The review was conducted, the plant's safety was verified, and the restriction was lifted.

* * *

One nuclear power plant was officially cancelled in August. Houston Lighting and Power will not build the Allens Creek unit. Two other utilities announced delays for nuclear units under construction. Responding to the Pennsylvania Public Utilities Commission's orders to cancel the unit, Philadelphia Electric decided to halt construction of Limerick Unit 2 until Limerick Unit 1's scheduled completion in 1987. The utility's plans now call for Limerick Unit 2 to begin operations sometime after 1990. Kansas Gas & Electric's Wolf Creek unit, delayed one year, is now scheduled to enter commercial operations in 1985.

* * *

Plant cancellations and delays are usually announced soon after the decisions are formally made. They also can be ascertained by reviewing public sources such as the World List of Nuclear Power Plants, published semi-annually in Nuclear News, the house organ of the American Nuclear Society. The latest edition, listing nuclear units that are operable, under construction or on order as of June 30, 1982 was published in August, 1982.

A comparison between the current list and that published in February, 1982 indicates that during the first six months of 1982, 15 US nuclear units which had been under construction or planned as of the end of 1981, were cancelled, indefinitely deferred, or delayed by at least one year. Those units are listed in Table 1.

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MARKET ACTIVITIES

Table 1

US NUCLEAR POWER UNITS CANCELLED, DELAYED OR INDEFINITELY DEFERRED DURING THE FIRST HALF OF 1982

Reactor	Utility	As of 12/31/81	As of 6/30/82
Cancelled			
Black Fox 1	Public Service of Oklahoma	July 1991	cancelled
Black Fox 2	Public Service of Oklahoma	July 1994	cancelled
Perkins 1-3	Duke Power Co.	indefinite	cancelled
Indefinitely deferred			
Pebble Springs 1	Portland G&E	September 1988	indefinite
Pebble Springs 2	Portland G&E	September 1990	indefinite
Hartsville A1	TVA	April 1991	indefinite
Hartsville B2	TVA	April 1992	indefinite
Yellow Creek 1	TVA	October 1990	indefinite
WNP 3	WPPSS	December 1986	indefinite
Delayed at least one year			
Clinton 1	Illinois Power Co.	August 1983	August 1984
Catawba 1	Duke Power Co.	March 1984	June 1985
Catawba 2	Duke Power Co.	September 1985	June 1987
Bellefonte 2	TVA	February 1988	November 1989
River Bend 1	Gulf States Utilities	April 1984	December 1985
Diablo Canyon 2	Pacific Gas & Electric	— 1982	— 1983

For the most part, these cancellations and delays have been well publicized. Of greater interest is the reported change in the "percent complete" column. There are 59 reactors actively under construction. They range from 100 percent to 4 percent complete.

Twenty of the 59 reported either no change or only a 1 point increase in percent complete. Several of these had been expected. For example, the South Texas Project has been changing project and construction engineers. Also, Pacific Gas & Electric's problems with Diablo Canyon Units 1 and 2 are well known.

Thus, 35 of the units under construction or on order as of the end of 1981, approximately 36 percent, experienced negative or essentially zero construction progress for the first half of this year.

* * *

Table 2 presents the US NRC's June estimate of the dates for issuance of reactor operating licenses. Since unforeseen construction or licensing delays cannot yet be taken into account, many of the projected issuance dates are based primarily on NRC's standard assumptions for licensing review times. The table is in chronological order by estimated operating license (OL) issuance date and has been modified to reflect events that have taken place since it was prepared. For example, the NRC issued the low-power OL for Susquehanna Unit 1 on July 17, 1982.

The NRC schedule calls for 37 nuclear units comprising 39.5 Gigawatts (GWe) to receive operating licenses during the period 1982-1986. The most recent Nuexco forecast, published in Report 164, calls for the addition of only 28.2 GWe over the same period. Table 3 shows a year by year comparison between the NRC estimate and the Nuexco forecast. Besides the substantial difference in the cumulative amounts, the two forecasts also differ substantially in timing. The NRC forecast calls for 30.7 GWe to be added to US capacity by the end of 1983, while the Nuexco forecast includes only 8.4 GWe in the corresponding period.

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Table 2

US NRC ESTIMATE OF SCHEDULE FOR ISSUANCE OF OPERATING LICENSES

Utility	Reactor	Net MWe	Percent Construction Completed	Utility's Estimated Construction Completion Date	NRC Estimated OL Issuance Date
1982					
Southern California Edison	San Onofre 2	1100	100	2/82	Full-pwr OL issued July, 1982
Commonwealth Edison	LaSalle 1	1078	100	4/82	Full-pwr OL issued Aug., 1982
Mississippi Power & Light	Grand Gulf 1	1250	95	6/82	Low-pwr OL issued June, 1982
South Carolina Electric & Gas	Summer 1	900	98	7/82	Low-pwr OL issued Aug., 1982
Pennsylvania Power & Light	Susquehanna 1	1050	92	7/82	Low-pwr OL issued July, 1982
Florida Power & Light	St. Lucie 2	777	81	10/82	9/82
Southern California Edison	San Onofre 3	1100	87	11/82	10/82
Arizona Public Service	Palo Verde 1	1270	95	11/82	11/82
Cincinnati Gas & Electric	Zimmer 1	810	97	12/82	11/82
Louisiana Power & Light	Waterford 3	1104	94	1/83	12/82
Commonwealth Edison	LaSalle 2	1078	84	1/83	12/82
Pacific Gas & Electric	Diablo Canyon 2	1106	98	0/82	0/82
1982 Subtotal:	12 reactors = 12,623 MWe				
1983					
Long Island Lighting	Shoreham 1	846	88	9/82	3/83
Duke Power	McGuire 2	1180	94	4/83	3/83
Commonwealth Edison	Byron 1	1120	79	4/83	4/83
Texas Utilities	Comanche Peak 1	1150	89	6/83	5/83
Detroit Edison	Fermi 2	1093	88	6/83	5/83
Union Electric	Callaway 1	1150	78	6/83	5/83
Consumers Power	Midland 2	807	74	7/83	7/83
Tennessee Valley Authority	Watts Bar 1	1177	80	8/83	7/83
Washington Public Power	WPPSS 2	1100	88	9/83	8/83
Tennessee Valley Authority	Bellefonte 1	1213	79	9/83	8/83
Cleveland Electric	Perry 1	1205	81	11/83	10/83
Arizona Public Service	Palo Verde 2	1270	75	11/83	10/83
Kansas Gas & Electric	Wolf Creek	1150	80	12/83	11/83
Public Service Co. of N.H.	Seabrook 1	1150	59	11/83	11/83
Consumers Power	Midland 1	522	74	12/83	12/83
Illinois Power	Clinton 1	933	83	1/84	12/83
Pennsylvania Power & Light	Susquehanna 2	1050	65	1/84	12/83
1983 Subtotal:	17 reactors = 18,116 MWe				

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MARKET ACTIVITIES

Utility	Reactor	Net MWe	Percent Construction Completed	Utility's Estimated Construction Completion Date	NRC Estimated OL Issuance Date
1984					
Tennessee Valley Authority	Watts Bar 2	1177	60	8/84	7/84
Duke Power	Catawba 1	1145	88	10/84	9/84
Philadelphia Electric	Limerick 1	1055	68	10/84	10/84
Texas Utilities	Comanche Peak 2	1150	57	12/84	11/84
Carolina Power & Light	Harris 1	900	55	12/84	11/84
1984 Subtotal:	5 reactors = 5,427 MWe				
1985					
Gulf States Utilities	River Bend 1	934	43	4/85	3/85
Commonwealth Edison	Braidwood 1	1120	61	4/85	4/85
1985 Subtotal:	2 reactors = 2,054 MWe				
1986					
Houston Lighting & Power	South Texas 1	1250	45	12/86	11/86
TOTAL 1982-1986:	37 reactors = 39,470 MWe				

Sources: 1. NRC's Montly Status Report to Congress, June 30, 1982
2. Nuclear Power Plants Construction Status Report, Data as of 12/31/81 (yellow book)

Table 3

FORECAST ANNUAL ADDITIONS TO US NUCLEAR GENERATING CAPACITY
(Thousands of MWe)

	1982	1983	1984	1985	1986
USNRC[1]	12.6	18.1	5.4	2.1	1.3
Nuexco[2]	3.9	4.5	5.7	8.9	5.2

[1] This Report, Table 2
[2] Nuexco Report 164, Table 5

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Sale:			
ACTIVE			
1575		500	Long Term
1610	150		
1818		250	Long Term
1845	160		
1877	50		
1900	800		some UF_6
1932	300		
1970	40		UF_6
1973	15		
1976	180		
1986	40		
TOTAL:	1,735		
INACTIVE			
1581B		150	Long Term
1664	100		
1774	50		
1804	600		
1805		500	Long Term
1920	3,000		
1925	500		UF_6
1928	1,000		UF_6
1951	1,250		
TOTAL:	6,500		

[1] Measured from the date of this Report

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MARKET DATA

URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Inquiries to Purchase:			
ACTIVE			
1638		250 per year	1983-89
1843		250	
1871		250 per year	1983-86
1915		500	UF_6
1933	160		
1945		500	
1964		500	
TOTAL:	160		
INACTIVE			
1459		200 per year	Long Term
1652		200 per year	Long Term
1888		500 per year	Long Term
1923	30		
1935		400	
1963		180	
1966	100	200	
1978		500 per year	1985-94
1979	30	175 per year	1983-93
1996		420	
1999		50 per year	1985-90
TOTAL:	160		

[1] Measured from the date of this Report.

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MARKET DATA

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF$_6$) 0 to 1 Year	Beyond 1 Year	Remarks
ACTIVE			
1584	550	300 per year	Long Term
1607	600		
1609	500	1,500 per year	Long Term
1925	450		
1936	200	200 per year	Long Term
1983	300		
TOTAL:	2,600		
INACTIVE			
1619		300	
1840	,300		
1902		350	
TOTAL	300		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF$_6$) 0 to 1 Year	Beyond 1 Year	Remarks
ACTIVE			
1594	400		
1622	250	700	
TOTAL:	650		
INACTIVE			
1594		450 per year	Long Term
TOTAL:	0		

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[1] Measured from the date of this Report.

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MARKET DATA

LOAN SUPPLY AND DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
ACTIVE			
1742	500		
1815	1,000		
1919	3,000		
1931	600		
1938	2,000		
TOTAL:	7,100		
INACTIVE			
1884	275		
1910	1,000		
1939	800		
TOTAL:	2,075		
Inquiries to Borrow:			
ACTIVE	None		
INACTIVE	None		

[1] Measured from the date of this Report

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MARKET DATA

CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller	Buyer	Remarks
1894	1982-83	101-300	—	US Utility	European Utility	Definitive price info not available
1901	1982	101-300	97	US Producer	US Utility	
1909	1982	51-100	96	US Producer	US Utility	
1910	1985-89	501-1000	indeterminate	Canadian Producer	US Utility	Price related to market
1911	1985-89	601-1000	indeterminate	US Producer	US Utility	Price related to market
1912	1982	51-100	107	US Producer	US Producer	
1915	1983	301-600	100	US Utility	US Utility	
1916	1982	less than 50	103	US Producer	US Producer	
1917	1986-87	301-600	indeterminate	US Producer	US Utility	
1923	1982	101-300	121	US Producer	US Producer	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller	Buyer	Remarks
1924	1982	101-300	111	US Utility	US Utility	

[1] Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.

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ESSAY

URANIUM PRICING — AN AUSTRALIAN PERSPECTIVE

The Australian government uranium policy released in 1978 established extensive controls over most aspects of marketing, development and export of uranium. That policy has three important objectives:

1. To support Australia's policy regarding international nuclear safeguards and, in so doing,
2. To foster public acceptance of uranium mining, milling and export;
3. To ensure that Australian producers receive "realistic market prices and fair contract conditions."

The federal government:

1. Controls the timing and conditions of a seller's entry into the market;
2. Requires the inclusion of certain commercial terms and conditions in all export contracts;
3. Determines limits on foreign investment for each project;
4. Establishes regulations designed to protect the environment;
5. Specifies conditions to protect the interests of local Aboriginal groups.

The Minister for Trade and Resources is required to determine minimum terms and conditions of sales contracts. These include:

1. the duration of the contract;
2. the quantity of uranium sold;
3. pricing terms and conditions; and
4. the end use for the uranium under the contract.

The government issues these "Determinations" before a seller is permitted to negotiate with potential buyers. Each Determination defines the limits within which a particular Australian seller may negotiate. If the seller does not comply with the Determination, the Minister will not approve the contract. The government maintains that this procedure leaves sufficient room for realistic commercial negotiations to take place.

The approved pricing mechanism involves a floor price, 55 percent of which is escalated on the basis of Australian cost indices for labor and materials. The actual floor price is confidential to the seller receiving a Determination, but it is no secret in industry circles that the present level of the standard floor price is approximately US$15 per pound U_3O_8 above the current Nuexco Exchange Value.

Australian producers have had no choice but to accept these procedures. Although the producers initially thought the government was intervening too much in the private sector, their views changed as spot prices weakened and eventually fell below the floor price. Recognizing the protective effects of the floor price, those producers holding contracts for large portions of the production capacities of their newly constructed mills adopted a more positive attitude towards the government's policy.

Now, in a time of acute market weakness, the government-enforced floor price promotes the economic health of Australia's two *operating* production centers, Nabarlek and Ranger. If the government were to remove or lower the floor price to conform to current spot price trends, it could very well undermine the price of uranium under all Australian export contracts. Therefore, both industry and government consider the maintenance of the floor price to be in their best interests.

Even developers of new projects for which no export contract has yet been negotiated, for example, Pancontinental and Western Mining, do not oppose the pricing mechanism. Their rationale is simple. Under the pressures of inflation and high costs of capital, they need to obtain prices at least equal to the government-approved price level to ensure the viability of their projects. As a result, Australian producers are virtually unanimous today in their support for the maintenance of the floor price.

From Australia's perspective, the present policy makes sense at least in the near term. It ensures high profitability to existing producers and makes potential buyers aware that the price for new uranium production from Australia must approach the incentive price needed for new developments. Otherwise, the investment would not be worth making and would better be postponed. The overriding attitude is summed up in the words of a senior politician, "We don't want to encourage projects that will end up bankrupt."

At the same time, government officials monitor market movements closely, always ready to offer policy advice to Ministers should there arise a need to revise the policy. So far, they are not persuaded that the floor price concept has actually prevented sales of Australian uranium. Their conviction is not universal. MIT's Thomas Neff observes, "If utilities can satisfy their needs for some years through the spot market, it is more likely that the price barrier will break."

Recent reports in the trade press have suggested that some dilution of the floor price concept is already occurring. Those reports have implied that the government allows producers to grant the buyer, once agree-

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ESSAY

ment on the floor price is reached, a holiday on escalation.

It is understandable that both government and producers are eager to squeeze every inch of leeway out of the present floor price policy without actually changing it, and why it has been successful. Since 1978, when Australia began to sell under the present policy, almost 100 million pounds U_3O_8 have been sold under long-term contracts. Furthermore, any change in its uranium policy could prove politically embarrassing to present government.

These are strong inducements. Preserving the present policy, the government maintains, has helped to create a healthier market. This belief, in turn, has strengthened the resolve to persist. Producers have operating mines certainly agree. Some support it as an economic and political expedient. Others justify it on the basis that the sales in the long-term market do not rest so much on contract price. They see long-term sales more as a function of the larger political patterns in the world which shape the perceptions of utilities in respect of their future security of uranium supply.

Developers of new mines who regard the long-term market as their opportunity do not lobby for overt change either. They believe the present floor price will simply become irrelevant. Major new uranium developments will require prices higher than the present floor price in order to meet cash needs and meet financing costs.

This partly explains why Australian producers have remained calm in the face of falling spot prices. Also, they see in this trend their opportunity to displace eventually some higher cost production elsewhere. Admittedly, some companies are more vulnerable than others if the development periods for their projects are extended further, perhaps even into the next decade. Failure to meet their targets will be blamed less on the floor price policy than on prolonged lead times. As a result of socio-political conditions, their ambitions have now slipped out of phase with demand.

Developers still display undiminished optimism, despite their underlying knowledge that they do not control their own destinies. Only the strategic choices of farsighted utilities with large, long-term uranium requirements will initiate new developments. Producers recognize their dependence on large forward purchase commitments at prices that make sense to the financial institutions which will be asked to fund their development plans. Not every uranium project will succeed in this limited market. Once the choices are made, the remaining projects face even longer delays.

For the uncommitted Australian producers, the past is still too vivid for comfort. They were ready to enter the market back in 1976, but political obstacles caused them to miss the peak of the producers' market dominance.

A thirty-year-old provision in the Australian laws had classified uranium as "a prohibited substance." Its export needed specific government approval which only emerged very slowly from successive Australian governments, both Liberal and Labor. Environmental legislation arrived four years after the discovery of Australia's extensive uranium deposits.

In 1975, the Ranger Environmental Inquiry under Justice Fox, which was to set the policy framework for the uranium industry, began its deliberations. Its largely negative conclusions were published two years later. Although public sentiment against uranium had diminished, it still demanded further study. One more year passed before the government published (in 1978) its policy regarding the export of Australian uranium. By then it was almost too late.

Meanwhile, customers who were buying during that period for long-term deliveries in the 1980s had obtained supplies elsewhere. The inability of Australia's producers to sell uranium from future developments had contributed to buyers' feverish pursuit of other sellers during those years. When Australian uranium companies finally were free to market, they encountered substantially diminished interest in their products.

Although Ranger and Nabarlek, the first projects to receive government export approval, had been able to sell their future production at good prices, the tide had turned in favor of the buyers. As they saw it, the proverbial boat which had been expected to take this new sector of the Australian mining industry into a prosperous future had left other Australian producers standing at the dock.

Now, uncommitted producers face an acutely oversupplied market at diminished prices; a strong demand for their production is largely a fond memory of the past. They are afraid the remaining demand will not allow more than one additional project to proceed in the foreseeable future. With this experience behind them, uncommitted producers are more preoccupied with the fear of "missing the boat" again than with a change in the floor price concept.

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MARKET ANALYSIS

US MARKETING ACTIVITY

Introduction

The US Department of Energy (DOE) recently released its annual "Survey of United States Uranium Marketing Activity," assessing supply, demand and prices in the US uranium market during 1981. Confirming Nuexco's previous observations, the DOE report found, among other things, that:

1. This is a buyer's market in which the use of optional delivery schedules and floor prices is increasing.
2. US utilities are using increasing amounts of imported uranium.
3. Unfilled requirements and uncommitted production are declining.

Pricing

The average US buyer's *contract price*, as reported by DOE, was $32.20 per pound U_3O_8 in 1981. Table 4 lists the corresponding price for each year since DOE began publishing such information.

Table 4

AVERAGE US BUYER CONTRACT PRICES AND MARKET PRICE SETTLEMENTS

Year	Price per Pound U_3O_8 (Year of delivery dollars)
1975	10.50
1976	16.10
1977	19.75
1978	21.60
1979	23.85
1980	28.15*
1981	32.20*

*Includes settlements of market price contracts. The 1981 data do not include uranium delivered under litigation settlements.

The average contract price reported by DOE *includes* settlements of market price contracts but *excludes* uranium delivered under litigation settlements. The 1981 average includes data for only 60 percent of the relevant material delivered to US buyers. Some prices had not been determined as of January 1, 1982; some prices were not reported to DOE.

At $24.19 per pound U_3O_8, the average 1981 Nuexco Exchange Value is considerably less than the average DOE reported contract price. The most important reason is that the DOE reported contract price includes deliveries under old contracts. The year to year increases in the average DOE price reflect the continuous expiration of deliveries under pre-1975 lower price contracts and the greater weight of higher priced agreements entered into in the 1975-1979 period. Another factor, of course, is that the Nuexco Exchange Value represents the market for spot and near-term deliveries and, as such, reflects the lower prices prevailing during 1981.

Delivery Commitments

Over the past several years, the number of US nuclear power plants under construction and on order has decreased dramatically. Low growth rates for electricity demand and high interest rates have forced some utilities to delay, defer indefinitely, or cancel plans for nuclear power plants. The result has been an unprecedented decrease in the need for uranium. As indicated in Table 5, uranium delivery commitments for the years 1981-1990 declined significantly during 1981. Delivery commitments for the years 1991-2000 increased only slightly, even though utilities have begun to arrange for new uranium contracts to cover those years.

Table 5

URANIUM DELIVERY COMMITMENTS
(short tons U_3O_8)

Delivery Year	As of 1/1/81	As of 1/1/82	Percent Change
1981	175,500	173,800	-1.0
1982	193,000	186,700	-3.3
1983	208,900	199,500	-4.5
1984	222,800	211,800	-4.9
1985	234,500	223,500	-4.7
1986	244,600	234,300	-4.2
1987	253,300	244,300	-3.6
1988	261,300	253,800	-2.9
1989	269,100	263,100	-2.2
1990	275,800	271,600	-1.5
1991-2000	315,200	317,700	+1.0

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MARKET ANALYSIS

Optional Deliveries

During 1981, US utilities more than tripled the amount of material on which they hold options. The data on optional deliveries point to two significant factors. First, in view of delays experienced to date, it is to be expected that utilities want to maximize flexibility in delivery schedules as new contracts are signed and older contracts renegotiated. Second, with prices down and uranium supply in excess of demand, this is a buyer's market. Buyers are in a better position to negotiate flexibility and options into their contracts as sellers compete for the limited business. Table 6 shows annual optional deliveries as of January 1, 1982, compared against the data from a year earlier.

Table 6

ANNUAL OPTIONAL DELIVERIES
(short tons U_3O_8)

Year	As of 1/1/81	As of 1/1/82	Percent Change
1982	400	200	−50
1983	500	400	−20
1984	600	800	+ 33
1985	300	500	+ 67
1986	300	1,700	+467
1987	300	2,300	+667
1988-98	4,200	16,300	+288
TOTAL:	6,600	22,200	+236

Floor Prices

Inflationary pressures and high interest rates have placed US uranium producers in the difficult position of attempting to make a profit in a market characterized by decreasing prices and increasing costs. To protect themselves from the cost-price squeeze, producers attempt to contract with floor prices whenever possible. Utilities, in order to obtain long-term delivery contracts with US producers, have in some cases accepted such pricing mechanisms. Table 7 indicates that, on balance, US market activity in 1981 led to an increased percentage of material committed under market price contracts having a floor price.

Table 7

PERCENT OF MARKET PRICE CONTRACT COMMITMENTS HAVING FLOOR PRICES

Delivery Year	As of 1/1/81	As of 1/1/82	Percent Change
1982	70	73	+ 4
1983	55	75	+36
1984	50	72	+44
1985	56	73	+30
1986	68	70	+ 3
1987	81	59	−27
1988	100	70	−30
1989	94	75	−20
1990	72	78	+ 8

The DOE survey does not indicate what portion, if any, of these contracts have clauses allowing the buyers to terminate if the market price were to drop below the floor price. In today's market, contracts are being negotiated with a wide variety of mechanisms to allow either buyer or seller or both to obtain full or partial relief in that case.

Imports

Reflecting the concern of US uranium producers over US utilities' use of uranium of other than US origin, the US Congress is debating some type of uranium import limitation. At present, two conflicting bills are in the House-Senate Conference Committee awaiting the end of the Labor Day recess. Table 8 shows that, during 1981, US import commitments for delivery over the next ten years increased by more than two-thirds.

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Table 8

US IMPORTS OF URANIUM FOR COMMERCIAL USE
(short tons U_3O_8)

Delivery Year	As of 1/1/81	As of 1/1/82	Percent Change
1981	1,900	—	—
1982	1,800	3,800	+111
1983	1,800	2,300	+ 28
1984	2,100	2,900	+ 38
1985	2,100	3,300	+ 57
1986	1,300	3,100	+138
1987	1,200	2,500	+108
1988	1,200	2,500	+108
1989	1,200	2,400	+100
1990	1,200	2,000	+ 67
1991	—	1,700	—
TOTAL:	15,800	26,500	+ 68

In 1981, 15 US utilities and one other US company delivered uranium of other than US origin to DOE enrichment plants. Canada was the most prominent exporter to the US; ten of the sixteen companies reported Canada was the origin of some or all of their imported material. Five companies imported material from France, three from South Africa, and one from Australia. Three listed the source as unknown.

DOE also requests that utilities state their policies on buying material originating outside the US. Those policies are summarized in Table 9. The results indicate an increased willingness to consider importing uranium, but at the same time an increased preference for domestic supplies. It can be surmised that market developments have forced consideration of non-US purchases, but recognition of that reality has crystallized US utilities' preference for domestic sources. US utilities are in the somewhat awkward position of wanting to support US producers to assure a viable domestic uranium supply, but at the same time having to satisfy price-conscious ratepayers and regulatory authorities.

Table 9

VIEW OF US UTILITIES ON PROCUREMENT OF FOREIGN-ORIGIN MATERIAL

	As of 1/1/81	As of 1/1/82
Utilities replying		
Utilities included	60	58
No reply	na	3
Policy		
No specific policy	26	29
Prefer domestic	7	13
Have limit on foreign	27	16
Plans to purchase foreign		
Will not	1	0
Unlikely	4	7
Uncertain	20	7
Possible	33	42
Current plans include buying	2	2

Uncommitted US Production

It comes as no surprise that the DOE survey found a marked decline in material available for sale by US producers. Some companies have placed operating mines and mills on standby until the uranium market situation improves. Other companies have curtailed production. Planned projects are being deferred or cancelled. Future startup dates and production rates of any of these operations are uncertain at this time. Table 10 summarizes the results of producer data on uncommitted production.

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Table 10

UNCOMMITTED URANIUM US PRODUCERS ESTIMATE WILL BE AVAILABLE FOR SALE
(short tons U_3O_8)

Year	As of 1/1/81	As of 1/1/82	Percent Change
1981	2,500	—	—
1982	2,800	2,800	0
1983	4,200	3,800	-10
1984	5,500	1,600	-71
1985	6,800	1,800	-74
1986	6,900	2,900	-58
1987	6,400	3,100	-52
1988	6,600	3,400	-49
1989	5,300	3,600	-32
1990	5,400	3,600	-33
1991	—	3,500	—
TOTAL:	52,400	30,100	-43

Inventories

Table 11 lists US utility inventory positions, showing both natural and enriched material. In 1981, eight utilities sold material for 1981-82 delivery and three made loans, with 75 percent of the sales and loans going to uranium producers. This reinforces previous Nuexco reports that producers are opting to buy uranium to meet commitments rather than produce it.

Table 11

URANIUM INVENTORIES HELD BY US BUYERS AS OF 1/1/82
(short tons U_3O_8)

Type	Utilities	All Buyers
Natural	44,100	51,200
Enriched	8,700	11,200
TOTAL:	52,800	62,400

US Utility Unfilled Requirements

The data collected on unfilled US utility uranium requirements is summarized in Table 12. Although there are a few years in which the amount increases, generally the amounts are declining. The obvious conclusions are that utilities are contracting for uranium supplies in the future and units are being cancelled and deferred, thereby reducing annual uranium requirements.

Table 12

UNFILLED US UTILITY URANIUM REQUIREMENTS
(short tons U_3O_8)

Year	As of 1/1/81	As of 1/1/82	Percent Change
1981	100	—	—
1982	500	300	-40
1983	1,000	1,600	+60
1984	2,600	2,600	0
1985	3,500	3,100	-11
1986	3,800	4,300	+13
1987	7,500	5,400	-28
1988	10,600	6,200	-42
1989	12,500	9,100	-27
1990	12,400	9,500	-23
1991	—	9,900	—
TOTAL:	54,500	52,000	- 5

Single copies of DOE's "Survey of United States Uranium Marketing Activity," July 1982, can be obtained by writing to:

S.V. Krusiewski
NE 32
US Department of Energy
Washington, D.C. 20545

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URANIUM OCCURRENCES IN SWEDEN

Introduction

The Swedish government initiated a uranium exploration program in the 1950s. The agency AB Atomenergi and designated private mining companies conducted extensive prospecting, primarily in the southern part of the country. The exploration effort concentrated on the bituminous black shales scattered throughout the south-central region. It was soon determined that low grade uranium was consistently dispersed throughout certain shale deposits. In the early 1960s, the government acknowledged the discovery of a low grade deposit containing an estimated 1,000,000 tonnes U_3O_8 in bituminous shale at Ranstad. At the time, it was considered one of the largest uranium deposits in the world.

The government considered that Sweden would be self-sufficient in uranium with the reserves at Ranstad and reaffirmed its policy decision to include a nuclear power base as an important part of Sweden's energy supply system. The initial nuclear power program was later expanded to include 13 units having a combined capacity of 10,460 MWe. The nine units presently operating have a total capacity of 6,400 MWe. The three units presently under construction are scheduled to begin operations by 1985. The construction permit for the 13th unit was never issued and the program was contracted to its present size of 12 units. The 12 units, when all are operational, will have a combined generating capacity of 9,410 MWe.

Uranium requirements for the 12 units are calculated at approximately three million pounds U_3O_8 per year. Although there is discussion in Sweden of phasing out the nuclear program by the year 2000, it is likely that more than 60 million pounds U_3O_8 will be consumed in the interim. The stated purpose of the exploration program was to fulfill Sweden's total uranium demand from domestic resources. When economic and environmental issues slowed development of the Ranstad deposit, the government accelerated uranium exploration in other geologic environments in an attempt to offset the need to purchase foreign uranium. Certain exploration programs remain active today, operating under the provisions of state-controlled exploration permitting and licensing procedures.

Exploration History

The responsibility for uranium exploration was reassigned to the Geological Survey of Sweden (SGU) in 1967. At the beginning of the exploration program, SGU was organized to conduct various aspects of exploration from regional reconnaissance to final evaluation and calculation of ore reserves. The techniques of uranium exploration were coordinated with the already established techniques used for other minerals, including geophysical and geochemical methods. The integration of different techniques greatly enhanced the development of new radiometric instrumentation and calibration procedures and the capabilities for computerized data collection and interpretation.

The Swedish Nuclear Fuel Supply Company (SKBF), formed in 1973 for the purpose of coordinating nuclear fuel supplies for the Swedish nuclear program, was also given overall responsibility for uranium exploration and presently directs all activities of SGU. Their working relationship in Sweden's joint minerals program has proved successful in several different geologic environments.

Glacial drift covers much of the basic geology of Sweden by a thickness of from less than one meter up to tens of meters. The techniques developed by the SGU for "reading" the drift material as to direction and distance of movement and the source of mineralized boulders contained therein have proved to be quite useful for prospecting. A variety of radon detection methods were developed and used with varying degrees of success; however, till-spectrometry proved the most effective exploration tool in drift environment.

Airborne and ground geophysics are used by the SGU as initial prospecting tools. Radiometric, magnetic and electromagnetic survey methods have been integrated to gain maximum information with each application. Geophysical anomalies are computerized for rapid interpretation, followed by on-site evaluation of separate anomalies. Ground electromagnetic and magnetic measurements are extremely useful to detect the distribution of shear zones and fracture patterns at various depths, especially where glacial drift covers the rock formation. Mineralization is commonly associated with such geologic features; thus, the early recognition of their occurrence often leads to favorable prospects.

Follow-up evaluation of a prospect includes detailed geophysical and geochemical surveys. On-site geologic studies of rock types and their relationship to structural features are carried out when the prospect area is not covered by glacial drift. If the evaluation shows favorable economic potential, the area of interest is trenched or core drilled to obtain samples for assaying. Radiometric logging of each drill hole is a necessary part of the

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evaluation program. Mineable ore reserves are calculated and the deposit is categorized as to its economic status. Project development is the next consideration. It is common practice for a private mining company to carry out all mining and processing of commercial ores.

During the course of the exploration program, SKBF has had an exploration license, or application for a license, on as many as 15 different potential areas at one time. Each licensed exploration area is usually identified with the nearest community. Exploration and evaluation activities often proceed without outside opposition. The right to mine uranium, either as the primary mineral or co-mineral, is subject to special government provisions, but final approval must come from the community. The decision by the community has precedence over government approval and a negative vote by a community can stop a development program.

Uranium Occurrences

There are 40 or 50 known occurrences of uranium mineralization throughout the areas already prospected in Sweden. About two-thirds of the shows are associated with other minerals in veins, fractures and faults in Precambrian rocks; the remaining occur in bituminous shales, plus intrusive and metamorphic rocks of post-Precambrian age. A great deal of the country remains to be prospected. There are excellent opportunities for additional discoveries, especially in the north portion of Sweden. Figure 1 is a map of Sweden showing the location of known uranium occurrences.

Only three or four occurrences have been considered for mining due primarily to orebody characteristics and prevailing economics. The first important discovery was at Ranstad where it was determined that a uranium-rich portion of bituminous shale represented one of the world's largest low-grade uranium deposits. Remnants of bituminous shales are scattered throughout southern Sweden and many are known to contain uranium. However, the Ranstad occurrence is the most promising because of its size and consistency of uranium content.

Ranstad

The uranium-bearing zone at Ranstad occurs in the upper portion of a shale series of Upper Cambrian age. The shale is horizontal and covers an area of about 500 square kilometers. Uranium occurs as an indistinct mineral in association with a phosphatic-organic zone which is 2.5 to 4.0 meters thick. The uranium content varies from 0.025 to 0.035 percent U_3O_8. Total uranium resources for the deposit are calculated at 1,000,000 tonnes U_3O_8, of which 300,000 tonnes are considered technically recoverable.

When the Ranstad occurrence was evaluated, it appeared that Sweden could supply all its domestic uranium requirements from the one deposit. A pilot mine and mill project was initiated in 1965, but after producing about 500,000 pounds U_3O_8, operations were terminated. The project proved to be uneconomic at the time, and the plan to mine an extremely high volume of shale was unacceptable to the public.

The government proposed to renew the project in 1975 and designated the state-owned mining company Luossavaara-Kiirunavaare AB (LKAB), AB Atomenergi and SKBF to conduct the recovery operation under the management of LKAB. The purpose of the project was to test the latest technology of large scale mining and recovery chemistry. Approximately 6,000,000 tonnes of ore were to be mined and processed annually. The project was again cancelled for essentially the same reasons stated above.

The Ranstad deposit contains at least nine minerals in addition to uranium, some of which are of economic importance. The deposit is therefore considered one of the most important sources of raw material in Sweden. In yet another attempt to develop the deposit, two of the largest mining companies in Sweden, Boliden AB and LKAB, formed a joint development and holding company, Aktiebolaget Svensk Alanskifferutveckling (ASA). Its purpose was to mine the deposit for uranium and other minerals, starting in early 1978. ASA requested from the government a license to mine and process 1,000,000 tonnes shale per year. The existing pilot plant was to be modernized to process full production by 1980. However, the project was formally rejected by the councils of two nearby communities in late 1977. The rejection could not be appealed by the mining companies and almost immediately, LKAB began to look elsewhere for another uranium project to put into operation.

Pleutajokk

In October 1980, LKAB applied for a license to mine and process uranium at the Pleutajokk deposit near the community of Arjelog. The SGU discovered uranium in the area of 1969. During the next 10 years, about 22 small deposits were discovered in the vicinity and the uranium potential of the new district was estimated at approximately 20,000 tonnes U_3O_8. Established reserves at the Pleutajokk deposit total about 4,000 tonnes U_3O_8.

The LKAB application, which has since been rejected

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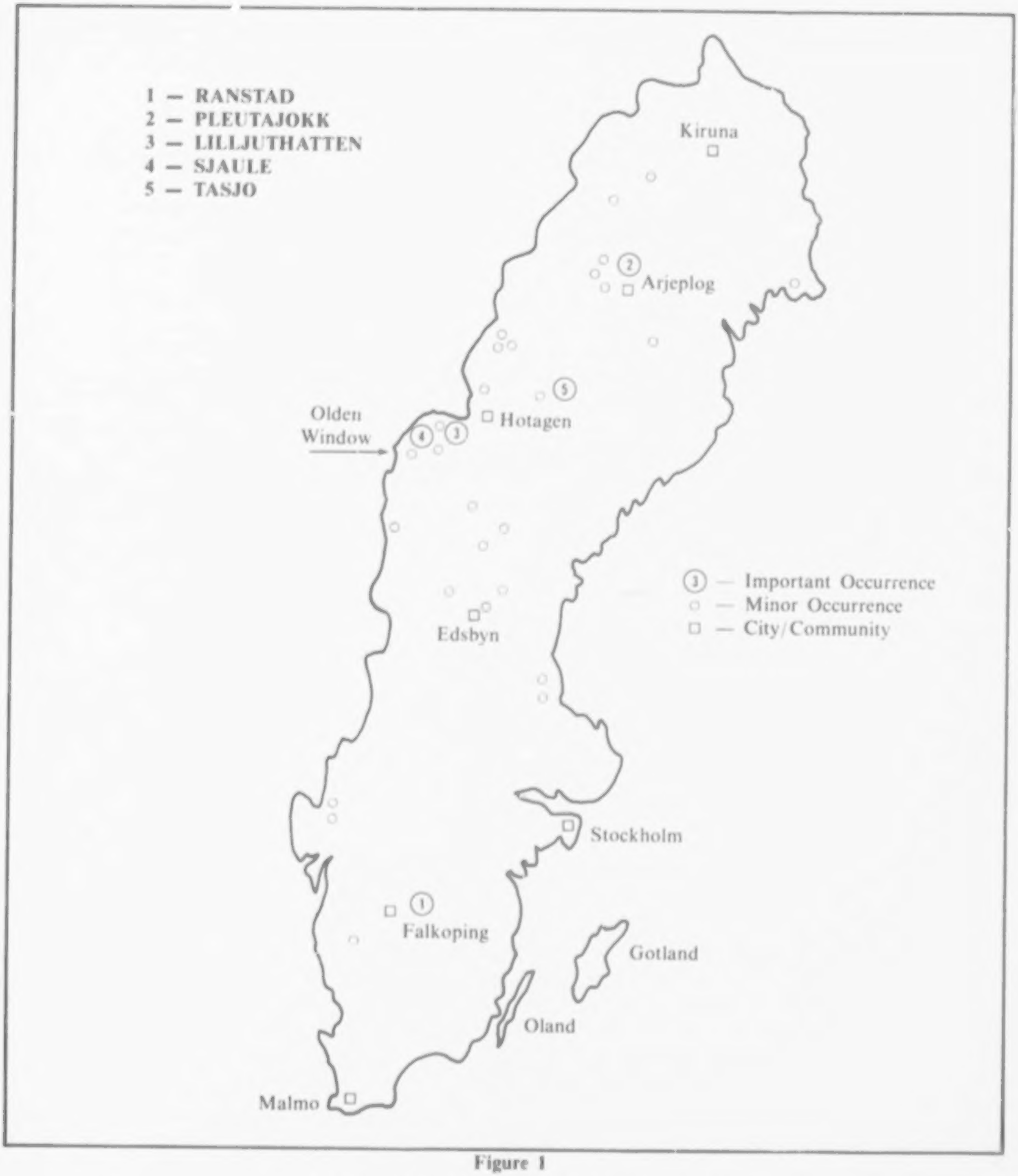
1 — RANSTAD
2 — PLEUTAJOKK
3 — LILLJUTHATTEN
4 — SJAULE
5 — TASJO
Kiruna
Arjeplog
Olden Window
Hotagen
Edsbyn
Stockholm
Falkoping
Gotland
Oland
Malmo
③ — Important Occurrence
○ — Minor Occurrence
□ — City/Community

Figure 1

URANIUM OCCURRENCES OF SWEDEN
Numbered Occurrences Are Described In Text.

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by local community reaction, was to mine the Pleutajokk deposit first and surrounding deposits second. The mineralization occurs as pitchblende and uraninite in veins, fractures and fault zones throughout a portion of volcanic and granitic rocks. The mineralization is estimated to be about 1800 million years (m.y.) in age compared to 1900 m.y. estimated for the host rock. The rock has been metamorphosed and ore-forming solutions are considered the source of mineralization, the placement of which was associated with the late stages of metamorphism.

The ore was to be mined by open pit and underground methods; 300 tonnes U_3O_8 per year were to be produced by conventional acid leach/solvent extraction technology. The plan included the mining of smaller deposits in the immediate vicinity of Pleutajokk. The project has been indefinitely postponed.

Others

Private prospectors discovered uranium in the Olden Window district located west of the community of Hotagen in 1972. The SGU investigation of the district revealed a number of scattered occurrences in at least three different rock environments. The two largest occurrences show mineral concentration in Precambrian granite. The most important one is located in the northeast corner of the window. Known as the Lilljuthatten deposit, the uranium is concentrated in fractures and breccia zones within a highly altered portion of the Olden granite.

The source of the uranium was probably the granite. Uranium occurs widely disseminated throughout the granite. During periods of metamorphism, hydrothermal solutions may have leached uranium from the granite mass only to transport and concentrate it within altered and fractured zones in the granite.

The deposit contains about 1900 tonnes of ore limited to a zone that measures approximately 225 x 100 x 50 meters. The average grade of deposit is 0.14 percent U_3O_8. The main uranium minerals are pitchblende and coffinite; secondary uranium minerals occur on fracture faces where alteration is most intense. The mineralization has been age-dated at about 420 m.y. compared to about 1650 m.y. for the granite.

A second deposit is located in the northwest portion of the Olden Window. Known as the Sjaule deposit, the uranium occurs in veins filling vertical joints in granite and highly fractured quartz porphyry. The main ore zone is about 280 meters long x 20 meters wide. Pitchblende is the main uranium mineral present. The U_3O_8 content of this small deposit is thought to be less than the Lilljuthatten deposit. However, mode of origin and concentration are thought to be the same.

There are other uranium occurrences scattered throughout the Olden Window. Uranium occurs in veins and fractures of altered metavolcanics and diabase dikes. Age and origin of the mineralization is considered the same as that of the larger deposits.

Uranium mineralization has been discovered in calcareous sandstone-shale sediments near the community of Tasjo in central Sweden. Uranium mineralization is up to six meters thick in a highly folded sandstone host rock. The uranium content is about double that found in the bituminous shale beds. The host formation overlies the shale beds and is considered as Upper Cambrian in age. It has been determined that the chemical composition of the ore is complex and for that reason, the evaluation program has second order priority.

A number of other uranium occurrences scattered throughout Sweden remain to be investigated, such as those in the Bodsjo-Edsbyn district where uranium-rich veins were discovered in quartzites and gneisses of Precambrian age. However, investigation of uranium occurrences has been de-emphasized according to a recent political decision and plans to continue exploration are under consideration.

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STATISTICAL DATA

EXCHANGE VALUE $17.00/lb. U_3O_8
Determined as of August 31, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:
A. The price of uranium delivered or to be delivered under old contracts.
B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

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[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of August 31, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
19.10	2.3	14	4

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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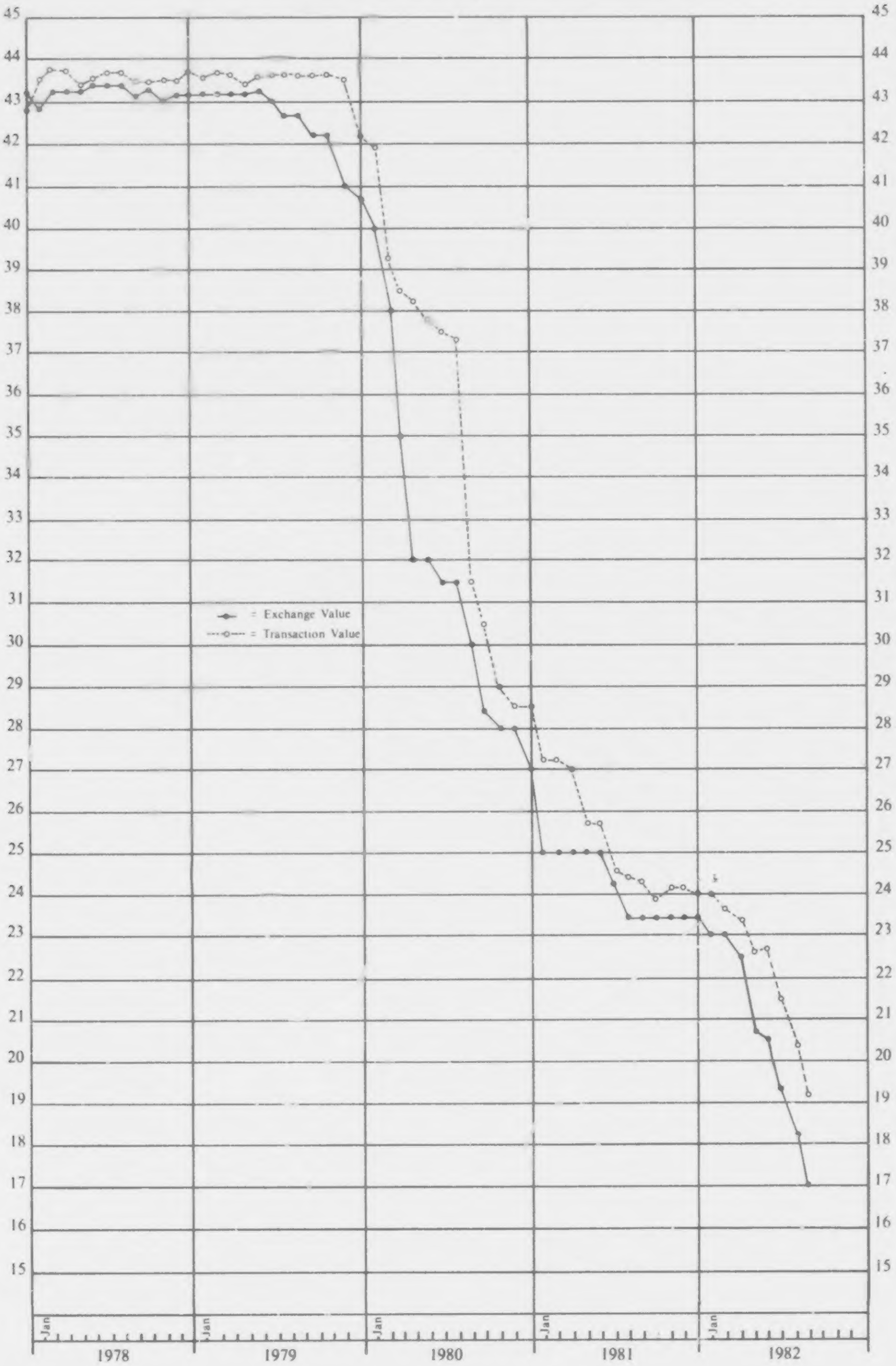
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00				

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10				

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	17.00	37.48	44.20
France (franc)	119.21	262.82	309.93
FRG (mark)	42.61	93.93	110.77
Japan (yen)	4,432	9,770	11,521
Switzerland (franc)	36.44	80.34	94.74
UK (pound)	9.93	21.90	25.82
Australia (dollar)	17.61	38.82	45.78
Canada (dollar)	21.09	46.49	54.82
Niger, Gabon (CFA)	5,965	13,150	15,507
South Africa (rand)	19.60	43.20	50.95
Sweden (kroner)	103.72	228.67	269.65

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[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $0.90/lb. U as UF_6
Determined as of August 31, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of August 31, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	**Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]**
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00
Annual Avg. 1981	355.3	238.18R
Mar 1981	355.2	229.66
Apr 1981	354.6	229.38
May 1981	353.4	237.31
Jun 1981	360.4	237.93
Jul 1981	356.9	237.86
Aug 1981	359.9	237.86
Sep 1981	357.4	238.00R
Oct 1981	351.6	239.26
Nov 1981	351.3	241.48R
Dec 1981	349.9	268.39R
Jan 1982	354.9	260.40R
Feb 1982	356.7	261.74R
Mar 1982	360.3	261.91R
Apr 1982	368.1R	261.76R
May 1982	367.9P	262.02R
Jun 1982	367.6P	262.84R

P = Preliminary R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Annual Avg. 1981	272.3P	12.02	9.03	9.53
Jun 1981	272.3	11.80	9.16	9.57
Jul 1981	274.3	11.92	9.20	9.62
Aug 1981	276.2	11.83	9.15	9.63
Sep 1981	276.9	12.47	9.22	9.77
Oct 1981	279.3	12.78	9.35	9.91
Nov 1981	278.8	12.89	9.45	9.89
Dec 1981	280.0	12.96R	9.42	10.03
Jan 1982	281.9	13.49R	9.53	10.11
Feb 1982	283.4	13.61R	9.60	10.19
Mar 1982	284.6	13.34P	9.62P	10.35
Apr 1982	287.4	13.42P	9.78P	10.46P
May 1982	288.7	—	—	—
Jun 1982	289.9P	—	—	—
Jul 1982	290.5P	—	—	—

P = Preliminary   R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Jan 1981	—	191.0	207.2	729,575	219,969
Feb 1981	—	193.8	209.8	725,647	210,275
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	700,375	257,173
Feb 1982	—	220.2	236.8	705,992	250,191
Mar 1982	45.49	225.2	237.4	—	—
Apr 1982	—	228.9	241.9	—	—
May 1982	—	230.3	244.8	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.55	11.98	9.12	7.62
Aug 1981	307.2	296.2	276.5	—	11.84	12.10	9.19	7.73
Sep 1981	307.4	295.7	279.3	195.61	12.10	12.70	9.38	7.75
Oct 1981	309.0	296.1	279.9	—	12.08	12.44	9.37	7.80
Nov 1981	309.3	295.9	280.7	—	12.12	12.48	9.42	7.83
Dec 1981	310.0	295.8	281.5	200.10	12.08	12.45	9.53	7.90
Jan 1982	311.8	298.3	282.5	—	12.19	12.66	9.68	8.02R
Feb 1982	311.6	298.6	283.4	—	12.22	12.61	9.68	8.09R
Mar 1982	311.0	298.0R	283.1	203.68	12.29	12.69	9.71	8.01
Apr 1982	309.9P	297.9P	284.3	—	12.23	12.68	9.81	8.03
May 1982	309.5P	298.6P	287.1	—	12.25R	12.71R	9.83R	8.05R
Jun 1982	310.7P	299.4P	290.6	206.35P	12.29P	12.91P	9.95P	8.11P
Jul 1982	313.0P	300.6P	292.2	—	—	11.42P	10.04P	8.17P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
	(Referenced to August 31, 1982)		
Exchange Value[1]	17.00	18.25	23.50
Transaction Value[1]	19.10	20.30	24.30
Conversion Value[2]	0.90	1.00	1.10
Loan Use Charge Rate[3]	6%	6%	5½%
Near-Term Uranium Supply[4]	1.7	2.6	7.2
Near-Term Uranium Demand[5]	0.16	1.0	4.0
Near-Term Supply-Demand Ratio	10.6	2.6	1.8
Optimum Tails Assay[6]	.341	.333	.287
Current Transactions[7]:			
Number of Transactions	10	6	4
Quantity of Material[8]	2.2-4.4	1.9-3.9	3.4-7.0

[1] US $ per pound U_3O_8 equivalent

[2] US $ per pound U as UF_6

[3] Percent per annum

[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)

[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)

[6] Percent U_{235}

[7] Uranium transactions only; does not include loans or conversion transactions

[8] Millions of pounds U_3O_8, equivalent

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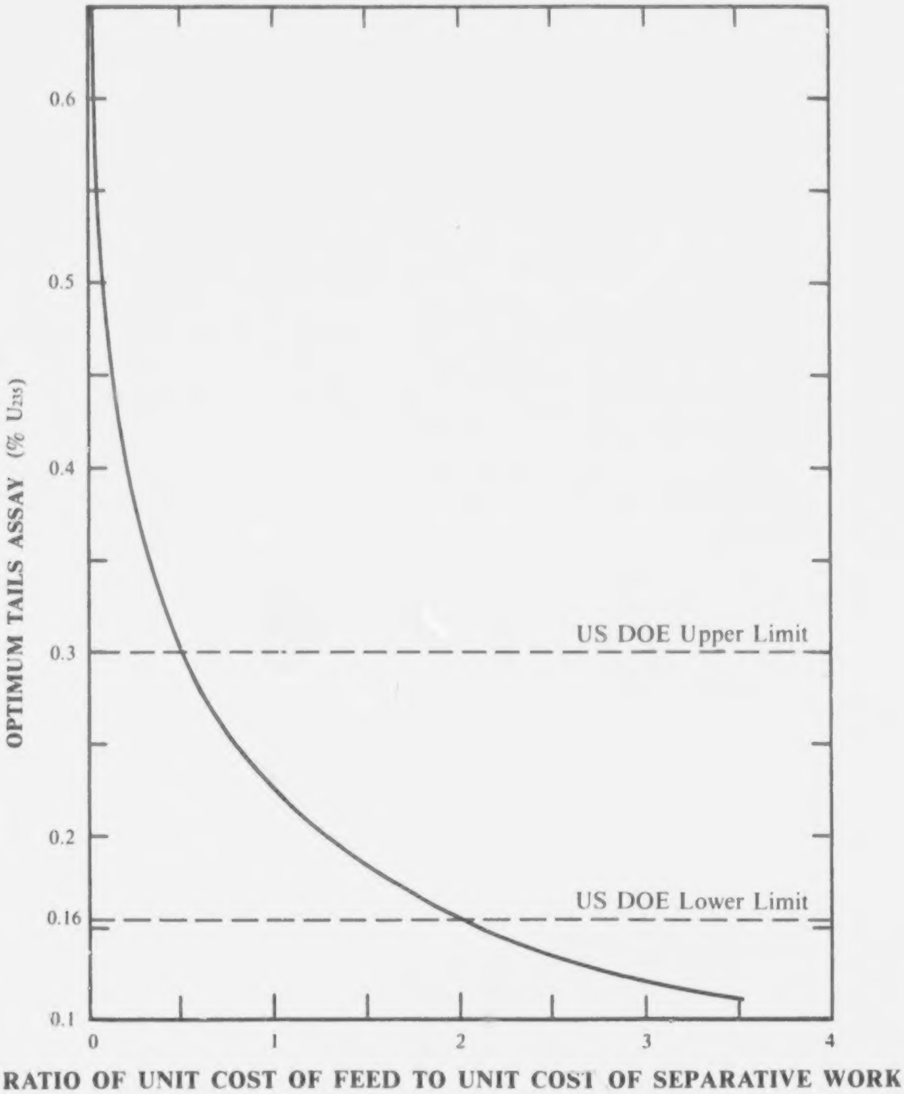
OPTIMUM TAILS ASSAY

The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. Holders of US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contracts have the option to specify, within limits, the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, natural uranium consumption increases about two percent.

TAILS ASSAY FOR MINIMUM COST OF PRODUCT



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STANDARD ABBREVIATIONS

ACTU:	Australian Council of Trade Unions
AEB:	Atomic Energy Board (South Africa)
AEC:	Atomic Energy Commission (US) (predecessor of NRC and DOE)
AECB:	Atomic Energy Control Board (Canada)
AFC:	Adjustable fixed commitment (swu contract)
AFR:	Away from reactor
AFUDC:	Allowance for Funds Used During Construction
AGR:	advanced gas-cooled reactor
BLWR:	same as BWR
BNFL:	British Nuclear Fuels, Ltd. (UK)
BWR:	boiling water reactor
CEA:	Commissariat a l'Energie Atomique (France)
CEGB:	Central Electricity Generating Board (UK)
CNEA:	Comision National de la Energia Atomica (Argentina)
COMINAK:	Compagnie des Mines d'Akouta (Republic of Niger)
DOE:	Department of Energy (US)
EEC:	European Economic Community
EIA:	Energy Information Agency (US)
EMR:	Department of Energy Mines & Resources (Canada)
ENEL:	Ente Nationale per l'Energie Elettrica
ENUSA:	Empresa Nacional del Uranio S.A. (Spain)
ERA:	Energy Resources of Australia
ESCOM:	Electricity Supply Commission (South Africa)
EdF:	Electricite de France
FBFC:	Societe Franco-Belge de Fabrications de Combustibles
FBR:	Fast breeder reactor
FRG:	Federal Republic of Germany
GCHWR:	gas-cooled heavy-water moderated reactor
GCR:	gas-cooled reactor
GNP:	Gross National Product
HTGR:	high-temperature gas-cooled reactor
HWLWR:	heavy water moderated boiling light-water-cooled reactor
IAEA:	International Atomic Energy Agency
INFCE:	International Nuclear Fuel Cycle Evaluation
JAURD:	Japan-Australia Uranium Resource Development Co.
JEN:	Junta de Energia Nuclear (Spain)
LGR:	light-water cooled graphite-moderated reactor
LMFBR:	liquid metal fast breeder reactor
LTFC:	Long-term fixed commitment (swu contract)
LWBR:	light-water breeder reactor
LWCHW:	light-water-cooled heavy-water-moderated reactor
MITI:	Ministry of International Trade and Industry (Japan)
MMN:	Metallurgie et Mecanique Nucleaires
MWe:	Megawatts of electricity
NAPOCOR:	National Power Corporation (Philippines)
NNPA:	Nuclear Non-proliferation Act (US)
NPT:	Treaty on Non-Proliferation of Nuclear Weapons
NRC:	Nuclear Regulatory Commission (US)
NSSS:	Nuclear Steam Supply System
NUFCOR:	Nuclear Fuels Corporation of South Africa Ltd.
OURD:	Overseas Uranium Resources Development Co., Ltd.
PHWR:	pressurized heavy-water-moderated and cooled reactor
PNC:	Power Reactor and Nuclear Fuel Development Corporation (Japan)
PSC:	Public Service Commission
PUC:	Public Utility Commission (US)
PWR:	pressurized water reactor
RAR:	Reasonably assured resources
RTZ:	Rio Tinto-Zinc Corporation Ltd. (UK)
SMDC:	Saskatchewan Mining Development Corporation (Canada)
SOMAIR:	Societe des Mines de l'Air
SSPB:	Swedish State Power Board
SWU:	Separative Work Unit
THTR:	thorium high-temperature reactor
TMI:	Three Mile Island (US)
TVA:	Tennessee Valley Authority (US)
UEGA:	Uranium Enrichment Group of Australia
UK:	United Kingdom
URDC:	Uranium Resources Development Corp. (Japan)
USBLS:	United States Bureau of Labor Statistics
VTAO:	Variable tails option (swu contract)
WOCA:	World outside communist areas
FIFO:	First in, First out
LIFO:	Last in, First out

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NUEXCO REPORT 169
EXECUTIVE SUMMARY

Exchange Value Drops $1.25, to $17.00	The **Exchange Value** as of August 31, 1982 is $17.00 per pound U_3O_8. Sellers continued their spirited competition for the few sales opportunities.
Near-Term Supply Decreases Slightly, Near-Term Demand Declines Sharply	*Active* sellers in the zero to one year time frame are offering 1.7 million pounds U_3O_8, down from 2.6 million pounds last month. *Active* uranium demand in the zero to one year time frame decreased sharply, to only 160 thousand pounds U_3O_8.
Supply-Demand Imbalance Continues	The ratio of near-term supply to near-term demand increased 10.6:1 this month. The past three months' wild swings in that ratio (9.5 to 16.2 to 2.6 to 10.6) are the direct result of the market's thinness. Because there are so few active participants, the actions of one buyer or one seller can have disproportionate effects on spot and near-term prices. This unstable market has the potential for sharp price movements.
Transaction Value Declines $1.20 to $19.10	The **Transaction Value** as of August 31, 1982 is $19.10 per pound U_3O_8. It includes 14 transactions totaling 2.3 million pounds U_3O_8 and covers a period of four months.
Ten Uranium Sales	Ten uranium sales are reported this month. The total quantity falls in the range of 2.2 million to 4.4 million pounds U_3O_8.
Conversion Value Drops Ten Cents to $0.90	The **Conversion Value** as of August 31, 1982 is $0.90 per pound U as UF_6, down ten cents from last month. One conversion transaction is reported. Active sellers are offering 2.6 million pounds U as UF_6 in near-term conversion services, while active demand amounts to only one-fourth as much.
Europe	In the **Federal Republic of Germany (FRG)** two recently issued construction permits could signal the end of the five-year de facto moratorium on new nuclear construction. The two units, Isar 2 and Emsland, bring to ten the number of FRG nuclear units under construction. In **Spain**, Asco 1 has cleared the final hurdle before fuel loading and startup. In the **United Kingdom**, five new sites for nuclear stations have been named.
Far East	**Japan** energy think tank confirms Nuexco's published opinion that official government targets for additions to nuclear generating capacity are too optimistic.
United States	1. Plateau shuts down and Kerr McGee cuts back 30 percent. 2. Full power license for LaSalle Unit 1. 3. Allens Creek nuclear unit cancelled, two others delayed. 4. Thirty-five of the US nuclear units under construction or on order as of the end of 1981, approximately 36 percent, experienced zero or negative construction progress during the first half of this year. 5. USNRC expected licensing schedule presented and compared to Nuexco forecast.
Essay	The fear of "missing the boat" again on uranium sales concerns Australian producers. The *Essay* presents an Australian perspective on uranium pricing.
Market Analysis	DOE annual "Survey of US Marketing Activity" is summarized.
Raw Materials	Describes uranium occurrences in Sweden.

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URANIUM: AN UNCERTAIN MARKET

Presented To:

The Uranium Institute
London, England
September 3, 1982

by

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URANIUM: AN UNCERTAIN MARKET

Today I will discuss various factors affecting the stability of the uranium market.

"Stability" means different things to different people depending upon their particular vantage points. For my purpose I am assuming that you are interested in stability from the dual standpoints of maintaining a healthy, viable industry for suppliers and an assured continuity of supply at reasonable prices for users.

Many factors contribute to stability, or to instability. Governments play a major role. Mineral economics have dynamic effects. Perceptions cause users and buyers to react differently from one year to the next. Power requirements change. Economies cycle. And uranium is not wholly independent of the world environment for commodities.

I would like to focus my discussion today mainly on how and why the market is behaving as it is. For this reason I will discuss mostly qualitative matters.

Fungibility requires viewing uranium in a world context. Much of my discussion, however, emphasizes the United States. This is partly due to my familiarity with that market; partly because it is the largest of the markets and partly because events there may be forerunners of events elsewhere.

I think it is sometimes helpful when analyzing a complex situation of the type prevailing in the uranium industry to go back into history and highlight key events which have brought us to where we are.

Three Major Events

Three events have been of particular importance:

1. *First*, a series of oil price increases took oil from two dollars to more than thirty dollars per barrel. At first, it had appeared that higher oil prices would strengthen an already healthy nuclear power industry. The opposite proved to be true. One hundred nuclear power plants had been ordered in the US in the six years before the 1973 oil embargo. Within a few years, cancellations and schedule deferrals began. All eight orders placed after 1974 were cancelled or deferred. Nuclear power fared better outside the US, but even there programs have fallen far short of expectations. Orders outside the US dropped from 23 in 1975 to seven in 1978.

Why this watershed in the mid 1970s? Why was it related to oil prices?

For 20 years prior to 1975 the United States had an average increase in Gross National Product (GNP) of four percent. Electrical power had grown seven percent per year. After 1975, GNP grew at an average of two percent per year. Electrical power growth averaged less than three percent per year. The need for new generating capacity of all kinds diminished. Various pressures decreased nuclear power orders more than alternatives.

2. The *second* major event I have called the "de-isolation" of the US uranium market. As you know, the US was isolated by Federal law until 1977, when a phasing down of restrictions began. Current regulations effectively allow the usage of 60 percent imports. The restriction is no longer of commercial significance.

Anyway, the US became increasingly important once it began to interact with the world market. Moreover, market assumptions prevailing at the start of that phase-down gave way to a different set. Back in 1977, the uranium world had different priorities. The US was expected to become a [substantial] net importer because domestic production would not be able to expand rapidly enough. As it turned out, the industry had actually overexpanded. The producer side needed *exports* rather than the user side needing *imports*. An export market might have developed to meet that need had it not been for the third major event.

3. The *third* major event, the discovery of high grade uranium deposits outside the US, made much of the US uranium industry uneconomic. Today the United States can produce only about four million pounds U_3O_8 [per year] at a forward cost of less than $20 per pound; non-US sources can produce over 50 million pounds. The resulting economic readjustment that is still underway has had major consequences for both US suppliers and US users.

***Ed. note:* As indicated in Report 168, the US component of Nuexco's estimate of Free World uranium resources reasonably assured at forward costs below US$20 per pound U_3O_8 accounts for 15,000 tonnes U_3O_8, only two percent of the total.**

These three events — declining demand, integration of the US market into the world market, and a shift in economic production locations, account for much of the current turbulence.

I do not, incidentally, include the accident at Three Mile Island (TMI) as one of the three key events. I believe that had the need for electrical power growth continued, the virtues of nuclear power would have

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surfaced more vividly with a higher degree of public acceptance as one result. But that did not happen when the need for nuclear power diminished.

Changing Perceptions

The events I have described are largely those related to concrete aspects of economics. Changes in perceptions are also having a major influence in subtle, less visible ways. Two in particular are important: security of supply and price trends.

Every user is concerned about *security of supply*. Interruption of plant operations, simply because fuel had not been provided for, would be an intolerable embarrassment as well as a major financial loss. How much, and in what form, should one invest to ensure continuity of operations is a crucial question.

Investment emphasis has been shifting. Whereas users focused heavily on U_3O_8 contracts and inventories earlier, U_3O_8 is not now viewed with the same relative importance. Other parts of the fuel cycle are receiving more attention. Because those shifting perceptions determine policy decisions so important to what may happen, I would like to discuss this further. For this purpose I have coined three terms: "horizontal security," "vertical security," and "collective security."

1. *Horizontal security* relates mainly to U_3O_8 supply. One may diversify according to geography, government, company, and so on. Each user determines the necessary mix to accommodate his circumstances.

2. *Vertical security* is concerned with where to invest amongst the fuel cycle choices. Does one achieve more security per investment unit by investing in ore reserves, U_3O_8 inventories, enriched uranium, or fabricated fuel — and in what combinations?

3. *Collective security* relates to the dependence each user has upon others, and they upon him. Each holds an inventory partly for the benefit of others, whether that is the intention or not. The converse is also true. Each inventory holder benefits from others' inventories, government stockpiles, international sharing agreements, and so on. Emergencies require voluntary and forced sharing, just as during the oil embargo.

The user has to put together all the elements of these three components of security — horizontal, vertical and collective — and determine an optimum for his particular situation. The importance of U_3O_8 will change with time and adjustments will be made accordingly.

Generally, the shift has been toward more concern in areas other than U_3O_8. For example, we have seen some non-US utilities diversifying enrichment contracts, some nations providing for self-sufficient domestic fabrication, and so on. At the same time, some utilities have reduced their in-house involvement in U_3O_8 production. Changes in perceptions have a great deal of leverage. Major market shifts can result from relatively small shifts in perception.

The second important perception relates to price trends. A few years back, the consensus was that U_3O_8 prices would continue to rise. Buying early was a small risk or no risk at all. Material would cost more next year. Today, inflation is slowing, interest rates remain high, and spot prices are declining. A loss of 20 to 40 percent in a year may result from buying early or holding after material has been designated for sale.

Uranium and Governments

Governments are important to the uranium industry. Private industry has become involved in the uranium business, but government has never disengaged itself. We do not have the time, nor I the knowledge, to discuss all relevant factors, but several have proved of particular importance in the past and are expected to be of importance in the future.

1. *First*, every major producer nation, with the exception of the United States, has a specific mechanism in place by which government may control prices and production. Whether, and to what extent, that power is used varies, but the means are available.

2. *Second*, governments tend to favor *regulatory* mechanisms over *free market* mechanisms. Governments generally lack the patience to wait for the results of the "invisible hand." Moreover, pressures from their own domestic industries encourage government actions as a political imperative.

3. *Third*, governments have a rapid impact if actions are negative — for example, former President Carter's reprocessing policies. But corrective results cannot be obtained quickly because psychological damage is usually one by-product. Repairing that is a slow process.

4. *Fourth*, antitrust laws have a worldwide influence. US antitrust laws, especially, come under criticism as inappropriate. Those laws, however, are deeply entrenched in American ideology. Substantive change is very, very difficult. I do not believe anyone should expect significant change within the time span of interest.

5. *Fifth*, governments have steadily increased their control over uranium to implement non-proliferation policies. Moral judgments between nations may differ.

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Contracts may exist, but governments feel free, and perhaps even obligated, to unilaterally impose their own standards even though agreements may be breached as a result.

The Market Today

I have discussed thus far a number of important developments which have shaped the current world market. I would like next to discuss some specific features of that market.

Merely to highlight market peculiarities, let me outline textbook economics in its simplest form: a commodity is produced, cost determined, a margin for profit is added, and an offer is made to customers. The customers make their choices. Low cost producers prosper. High cost producers fail.

Against that simplistic theory, consider the following:

1. As of July, 1982, approximately 17,000,000 pounds U_3O_8 were being offered for near-term sale.
2. Of material offered, approximately 90 percent was by *users — not* producers.
3. Of the active buyers, 70 percent were *producers — not* users.
4. Almost twenty pounds of material was offered for each pound sought by an active buyer.
5. Offering prices were *below the costs* of most producers.
6. World production continues at nearly *double* the rate of actual consumption.
7. Spot market prices have declined more than 50 percent during the past two years.

What we are witnessing obviously does not follow simple, textbook economic theory.

As an aid for an analysis of today's market, I have coined two terms: *use-demand* and *displacement-demand.*

1. *Use-demand* is conventional. Use-demand is needed to fulfill the primary purpose of fueling nuclear power plants. For this purpose, volume is relatively fixed by base-loaded operating plants. Volume does not depend on price. Whether uranium was selling for five dollars or fifty dollars per pound would make little, if any, difference in the rate of consumption by reactors.

2. *Displacement-demand* is demand created by producers' make-or-buy decisions. The lower the price, the more apt a producer is to buy rather than produce. Price must be below production cost, partly to offset non-economic factors encouraging continued operations. The lower the price, the greater the number of producers who find it economic to fulfill contracts by purchase rather than production. Lowering price *does* increase volume in this case.

It makes a great deal of difference to the market which type demand is in control. Displacement-demand controls the spot market price today. As users feel compelled to dispose of excess inventories, prices are being driven to whatever level is required to create enough displacement-demand to allow disposition [of the excesses].

The price influence of displacement-demand reaches beyond the spot market. Numerous long-term contracts are related to "market price." Market price is sometimes equated to the prevailing spot price. In this way, inventory selling is thus controlling some long-term contract prices.

To be more specific, if you were a producer in possession of a long-term supply contract containing a spot market price provision, the prices you would receive for deliveries next year would be those determined by the inventory-seller-dominated secondary market. Those prices probably have little, if anything, to do with the cost of your production or that of your competitors. Because the forces controlling that secondary market have not yet run their course, you would probably look forward to low, unpredictable prices for some time.

How long is difficult to say. My own view is that if world inventories were down to roughly two or three years of actual consumption, and if production rates were within twenty to thirty percent of actual consumption, we might look for return of a more or less normal market quite soon. But world inventories are more than ample for five or six years. Production is roughly double consumption. The supply-demand balance is not improving, but is worsening.

A respected Nuexco client, a US producer, recently commented that he thought everything could be set right if all production would simply stop for two years. Inventories would be reduced; utilities could redistribute; new, rational contracts could be negotiated. Of course, the remark was made in jest, but it does illustrate the problem and the solution.

Long-Term Contract Prices

I have pointed out how spot prices can become long-term contract prices, and how that is working to the discomfort of producers.

An argument is often made that long-term contract prices and spot prices should not be related. The two, it is argued, should not be related either in one's mental processes or in contract terms. However, they can be

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related simply by the process I mentioned — namely, that the long-term market price is equated to spot price.

I doubt that a long-term contract price will ever be published in the same way spot prices are published. A spot price is based heavily on the intrinsic value of uranium. When delivery is to be made immediately, the relationship of the Buyer, Mr. A, to the Seller, Mr. B, is not important enough to change the price significantly.

When the relationship may extend 10 to 20 years and Mr. B, Mr. C and Mrs. D have widely different situations with respect to size of deposits, national origins, capitalization, and so on, then the relationship becomes highly important. Our Buyer, Mr. A, may be willing to grant terms to Mr. B he would not even consider for Mr. C or Mrs. D.

The value of the relationship becomes a major component in a long-term contract. Thus, the long-term contract price reflects not only the intrinsic value of uranium as a material, it reflects the value of a particular match between a particular buyer and a particular seller. A long-term price can be defined, as it sometimes is, as an average of many situations. However, in the final analysis, the result is simply that — an *average.*

Producers' and Users' Dilemmas

All these changing markets, industrial structures and relationships pose dilemmas for users and producers.

Producers have competing interests. They need to sell above cost, but they need to buy below cost. As there is only one spot market price, producers have an insoluble dilemma. It is not unusual in today's market for a producer to buy for an existing contract need and to deliver that purchased material to a utility purchaser who is obligated to accept, but has no current need. The utility may then sell it as excess to another producer.

The result of depressed prices and production cutbacks also poses dilemmas for users. The deeper and sharper the price depression, the higher and sharper an eventual rebound. How to compensate, and when, is not clear.

Commodity and Indices

How is uranium doing relative to other commodities?

Despite widespread belief to the contrary, uranium has not been a volatile commodity with frequent cycling. Uranium sold in the six to eight dollar per pound range for 20 years prior to 1974. Prices rose in 1974, 1975 and 1976 to over forty dollars. That level held for three years. Then the price began a decline which has not yet run its course. Uranium has had only that one aberration so far, but it was major. The aberration covered six years.

For comparison, we might go back to 1970, a few years before the oil embargo, and consider what has happened in the interim. We will compare uranium with four of the world's closely watched indices: the US Consumer Price Index, oil, gold and the Swiss franc.

Uranium sold for a little more than six dollars per pound in 1970. Had uranium maintained a fixed relationship to the Consumer Price Index, it would now be selling for approximately sixteen dollars per pound.

Oil was selling for two dollars per barrel, and is now more than thirty dollars. Had U_3O_8 maintained a fixed relationship, the price would now be nearly $100 per pound.

Because of what happened with oil, an often asked question is whether a UPEC might follow OPEC. We might digress on that for a moment.

An effective OPEC required, apart from government cooperation, that several conditions prevail. The first was a world dependency on oil from the Middle East. The second was a significant US dependency on the same oil. That developed by 1973. The third was that inventories should be small, so that a boycott would create a shortage quickly.

At one time, it appeared that similar uranium conditions might develop. A UPEC was a theoretical possibility. Governments had the means to control export prices. Supply from all major exporter nations was thought *essential.* Many users had small inventories.

Conditions changed. Demand decreased substantially. Inventories mounted for voluntary and involuntary reasons. Supplier nations were no longer *essential*, only *optional.* The conditions which had allowed OPEC to be effective virtually evaporated as far as uranium is concerned. In fact, conditions changed so much that a uranium boycott might even be welcome in some quarters — the US, for example. Producers would be delighted by diminished competition. Utilities could redistribute unbalanced inventories. The US government might even dispose of part of its large stockpile, the purpose of which has become increasingly obscure.

Gold sold for 35 dollars per ounce in 1970, and now is $350. Had uranium maintained a fixed relationship to gold, its price today would be more than sixty dollars per pound.

The Swiss franc doubled in value compared to the dollar. Had uranium maintained a fixed relationship with the franc, it would be selling for approximately

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fourteen dollars.

All in all, uranium has not fared poorly by those comparisons. It gained against the Consumer Price Index and the Swiss franc, and lost against oil and gold. Whether uranium has had relative price stability when other standards are considered is difficult to say. It does appear, however, that uranium is probably no more volatile than much of the non-uranium world.

Summary and Conclusion

Uranium is a commodity whose single purpose makes it captive. Uranium cannot develop a destiny of its own. Creative technological or commercial approaches cannot enlarge the market, as they might with resources such as coal.

The uranium industry is like the core of a system of concentric spheres. Surrounding that core is the nuclear power industry; surrounding nuclear power is the electrical power industry; and surrounding the electric power industry is an economic system. The core cannot change those external environments. On the other hand, those external environments have a critical impact upon the core.

That core, the uranium industry, is undergoing adjustment as stresses build up and are relieved. Early relief cannot be expected to come from the world outside. General economic conditions, slow electrical growth, and nuclear power obstacles continue to exacerbate the problems.

Little can be done by industry or government. Patience is required. Government's regulatory cures, its main weapon, will only shift problems from one area to another. More use-demand, the basic need, is not within the power of industry or even of government to create.

My view is that the best solution will evolve out of a free market. True, there will be continued pain for the supplier, but that pain is unavoidable. Economic forces are so strong that interference would likely be counterproductive. The disarray of the world outside cannot be overcome by regulation.

Using the lessons of history is contingent upon an ability to identify recurring situations. One such series can be identified as over-optimism. We virtually institutionalized over-optimism.

Now the direction is changing. A new danger must be considered.

Current difficulties and those ahead may encourage us to institutionalize over-pessimism. Somehow, we have to focus on the longer pull while traversing the short pull. Achieving stability, I firmly believe, lies in locating and working in that seam of reality between extremes of over-optimism and over-pessimism. If we do so, we shall eventually have a stable, viable producer industry and a confident, satisfied group of users. But the course to reach that goal will not be easy.

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Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET

October 1982 No. 170

R. WESLEY MILLER, *EDITOR*

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FOREWORD

Nuexco was saddened by the untimely deaths this month of two unusual men, each of whom played central roles in the development of the uranium industry.

Robert W. (Bob) Adams, Chairman of Energy Fuels, died in New York City on Friday, September 24, at the age of 64. Bob's career in the uranium industry spanned 30 years from prospector to Chief Executive Officer. He founded Western Nuclear Inc., took it public and merged it into Phelps Dodge. Following his resignation from Western Nuclear, Bob started Energy Fuels. Beginning with ore-buying stations, the Energy Fuels operation has expanded to include a number of mines and the new mill in the Blanding, Utah area.

Alaster G. (Al) Swanson, President of Marline Oil Corporation, died in London on Saturday, September 4, at the age of 51. While perhaps not as well known within the international uranium community, Al's contributions had enormous impact. In 1968 he organized an exploration program which ultimately led to the discovery of Rabbit Lake and other now-famous ore deposits in Northern Saskatchewan. In 1971, Al became associated with Pan Ocean Oil, rising to Vice Chairman. In 1976, he became President of Marline Oil, and was a driving force behind the exploration for new uranium districts in the eastern United States. These efforts culminated in July 1982 with Marline's announcement of a large discovery in southern Virginia.

We extend our sympathies to the families and colleagues of these extraordinarily energetic and dedicated men. Bob and Al were true pioneers. They will be missed.

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or by contacting our US offices in New York City or Menlo Park, California.

MARKET ACTIVITIES

PRICING

The **Exchange Value** as of September 30, 1982 is \$17.00 per pound U_3O_8, unchanged from last month. During September, the spot and near-term markets were unusually active for the fourth consecutive month. The *Market Data* section lists seven uranium transactions this month, involving a total of 750,000 to 2,000,000 pounds U_3O_8 equivalent.

The market weakened in active trading in the early part of September, only to recover to its initial level in the latter part of the month. There are several reasons for the recent strengthening:

1. A US producer aggressively entered the market and purchased a substantial portion of the material then available for immediate or short-term delivery.

2. Additional utility demand appeared during September.

3. Three aggressive sellers of substantial quantities are now either sold out or very nearly so. The remaining active sellers are not competing so vigorously for sales. For most of this year, the market has been characterized by the willingness of a few particularly aggressive sellers to cut prices as much as necessary to sell their material. However, the mood of the most active sellers in today's market is one of less urgency. Resisting buyers' efforts to extract lower prices, they show less willingness to reduce prices in the hope of stimulating demand.

4. Some US producers and consumers seem eager to believe that the US will enact an import embargo and that it will firm up prices. The prevalence of that belief could be behind some market participants' current behavior.

One caution is in order. The events of recent months have not altered the fundamental imbalance between supply and demand. The phenomenon described here is strictly one of the spot and near-term markets.

Active uranium supply (material offered at competitive prices, terms and other conditions) amounts to 3.3 million pounds U_3O_8 in the near term, nearly double last month's level of 1.7 million pounds U_3O_8. Even after transactions representing more than one million pounds U_3O_8 were concluded during the month of September, *active uranium demand* rose to 660 thousand pounds U_3O_8 as of the end of the month. Therefore, the *supply-demand ratio* declined to 5.0:1.

* * *

The **Transaction Value** as of September 30, 1982 is \$17.30 per pound U_3O_8, down \$1.80 from a month ago. The current Transaction Value includes 16 transactions totaling 3.2 million pounds U_3O_8 and covers a period of three months. The large drop in Transaction Value is attributable to relatively heavy activity in the spot and near-term markets over the past three months. This month, transactions from May and June, when market prices were substantially higher, dropped out of the Transaction Value calculations.

* * *

The **Conversion Value** as of September 30, 1982 is \$1.10 per pound UF_6, up twenty cents from a month ago, but in a very thin market. Active offers to sell conversion services in the near term amount to approximately 1.8 million pounds U, down somewhat from last month. However, *active conversion demand* amounts to only 100 thousand pounds U, last month's active demand having moved into the inactive category. Despite the paucity of activity, there is a consensus that the price required for secondary market transactions is substantially higher than last month.

* * *

The **Loan Use Charge Rate** remained at six percent per annum. Some discussions are taking place and one large transaction remains under negotiation, but the loan market is generally quiet.

AFRICA

Uranium production from Blyvooruitzicht and Harmony (both managed by Rand Mines) increased slightly in the year ended June 30, 1982 to 1,876,000 pounds U_3O_8.

Uranium Concentrate Production During Year Ended June 30 (pounds U_3O_8)

	1982	1981
Blyvooruitzicht	586,000	644,000
Harmony	1,290,000	1,209,000

In his annual statement, Blyvooruitzicht chairman Mr. D.T. Watt noted that "profit from uranium operations was R7.1 million for the year as compared with R12.4 million for the previous year. The decrease was due to rising costs, decreased revenue and slightly lower sales. The latter factor arose from revised delivery schedules specified by the company's customers and

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resulted in an increase of R1 million in value of processed uranium on hand."

He further noted that ". . . the spot price for uranium continued to decline. There are still no clear signs of any revival in the ordering of new nuclear power plants and it therefore appears that there is little prospect of any material improvement in market conditions in the short to medium term . . . [Blyvooruitzicht has] satisfactory contracts for the bulk of the uranium to be produced over the next few years. Unless the company is able to enter into contracts for the supply of uranium at prices substantially better than current market prices, it is likely that the company will cease production of uranium oxide in or about November 1984, at which time the processed uranium stockpile will contain sufficient material to fulfill all outstanding contracts."

Commenting on Harmony, Mr. Watt said, "There is a considerable surplus stockpile of uranium overhanging the market. Much of this surplus material was under the control of utility companies in the US which found the cost of carrying such surpluses to be intolerable at the current high rate of interest. Liquidation of these stockpiles, at prices below the cost of production for many US mines, has been one of the main factors in the continued softening of the market. However, the decrease in the value of the rand against the US dollar has largely offset the drop in US dollar prices and significantly improved the company's uranium revenue in rand terms."

"With . . . the current rate of exchange between the rand and the US dollar, your company expects to continue to enjoy profits from its uranium operation for the next year. In the longer term increased contract prices will be necessary to ensure profitability at current production levels. Failing such price increases, some form of rationalization of uranium production to reduce operating costs may be necessary."

AUSTRALIA

Developers of the Beverley uranium deposit in South Australia (Western Nuclear Australia Ltd., a Phelps Dodge subsidiary, 50 percent; Oilmin, 16.6 percent; Transoil, 16.6 percent; Petromin, 16.6 percent) plan to install a pilot plant next year to test in situ leach techniques. Establishing the pilot operation will cost A$3.4 million. The first commercial unit, approximately twenty times the size of the planned pilot unit, could be installed by 1986 to produce approximately 500,000 pounds U_3O_8 per year.

CANADA

The major topic of discussion in Canada is the US embargo legislation and its potential impact on Canadian producers. However, only speculation is possible at this point, because the detailed language of the embargo enabling legislation has yet to be determined. Although there is certainly irritation in Canada about the prospect of an embargo, any real impact should be minimal as long as existing Canada-to-US sales contracts are honored (grandfathered).

The only sellers in Canada now are the Key Lake partners (SMDC, Uranerz and Eldorado), and Key Lake production is essentially committed through 1985. The embargo could well prompt US utilities to speed up their contracting plans on longer term Canadian supply contracts in order to be included under the grandfathering provision.

Most of the exploration and development plans for new projects in Canada have been reduced or postponed already due to poor market conditions, so the possibility that an embargo might further reduce their market is of little consequence.

There has been some concern expressed in Canada that the embargo could somehow impede the swap of Gulf's Canadian uranium assets for the Eldorado stockpile, but that seems highly unlikely at this point. The deal has been formalized by the parties and is expected to become effective sometime in October. The swap will restore Eldorado's status as a major uranium producer, a state of affairs that had been dormant since Beaverlodge closed.

Aside from some possible uncommitted production from Rabbit Lake, the biggest prize in the transaction for Eldorado would seem to be Collins Bay. The Collins Bay project has not yet been approved by the provincial government of Saskatchewan and no real development work has started. Ore from Collins Bay is expected to begin feeding into Rabbit Lake mill by 1985 or 1986.

EUROPE

In **West Germany**, the relief of the licensing logjam may have come at a most opportune time. The federal government's recent decision to impose a much more restrictive emissions standard on electric utilities could very well increase pressures to build nuclear power plants. It is not yet clear how the new standard will be applied, but utilities are worried that they might be forced to shut down coal-fired generating plants.

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The new standard for sulphur dioxide (SO_2) emissions is less than half the old; the limit of 850 milligrams SO_2 per cubic meter of flue gas was reduced to 400 milligrams per cubic meter. Even more disconcerting to utility executives is the government's stated intention to apply the stricter standard to older, formerly exempted, power plants. Since almost no German coal-fired power plant meets the new standard, many such plants now in operation will probably be forced to upgrade emission controls — at substantial costs — or cease operations. Coming at a time when nuclear power's economic advantage over coal is often called into question, this development should increase pressure to order nuclear power plants and to license and construct those already on order in Germany.

* * *

The Uranium Institute held its seventh annual symposium in London on September 1-3, 1982. Some of the most prominent speakers and the topics on which they spoke are listed below, in the order of their appearance on the program.

Speaker	**Organization**	**Topic**
Dr. David Chu	Taiwan Power Co.	Nuclear power generation in a newly industrialized coountry
Mr. Jim Bonny Mr. Murray Fulton	Saskatchewan Mining Development Corp.	The Uranium Equation in 1982
Mr. Hugh Douglas	Hugh Douglas & Co., Ltd.	The merchant uranium market and its effect on price
Mr. Phillip Crowson	The Rio Tinto-Zinc Corp.	Uranium production cost structures
Mr. Bob Wolcott	Nuexco	Uranium: an uncertain market
Mr. Jim Clay	European Economic Community	Past attempts to stabilize other commodity markets
Mr. Ray Livingston	Australian Uranium Export Office	Can market stability be improved? Government and export contract approvals
Dr. Klaus Messer	Rheinisch-Westfalisches Elektrizitatswerk AG	Consumer reaction to Wolcott, Clay and Livingston speeches
Mr. Reginald Worroll	Chamber of Mines, South Africa	Producer reaction to Wolcott, Clay and Livingston speeches

Those who were not fortunate enough to attend the symposium may be able to gain something of its flavor from the following speech excerpts. To obtain copies of the symposium proceedings, please contact The Uranium Institute.

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Mr. David Chu, Taiwan Power Co.

Nuclear power generation in a newly industrialized country

One of the most important factors contributing to our low electric tariff rates is the utilization of nuclear power . . . Nuclear power generation represents 19% of the total power generation in 1980 and 25% in 1981 in Taiwan. . . Moreover, according to our own operating experience, nuclear power generation is not only safe and reliable but also highly economical. . .

. . . nuclear power has a substantial economic advantage over either coal-fired or oil-fired power generation. The total cost of nuclear power generation is only one-third of the fuel cost for oil-fired generation.

. . . Taiwan is very poorly endowed with fuel resources. When additional fuels are needed, our choice is between nuclear and fossil fuels, all of which have to be imported. So far imported oil has made the major contribution to imported energy, which represented roughly 86.38% of the total domestic energy consumption as recently as 1980. And the cost of oil imports was as high as 20.8% of our total export income in 1980.

This is a very unhealthy and risky situation. The remedy should be to change our economic and energy policies from an oil economy to an electric economy. And the key to the success of an electric economy is to maximize the utilization of nuclear power.

Taipower's nuclear power programme consists so far altogether of six units under three projects, each with a twin-unit arrangement. . .

Regarding this programme, a number of features are worth pointing out:

1. Construction management was done by Taipower itself, even for the first Unit. . .

2. . . . Units II-1 and II-2 are the only operating BWR6 units in the world, even though several other BWR6 units started construction earlier than ours.

3. The construction costs appeared to be reasonable, and this has led to the attractive electricity production costs . . .

4. We found the twin unit approach a very beneficial one. The experience obtained from the First Unit can immediately be applied to the Second, while memories are still fresh. Spare parts for the second unit can be readily made available for the first unit. The construction force for two units is only about 1.5 times that for a single unit, because people can work on the second unit when they are not busy on the first. . .

Taipower believes that nuclear power technology today is not yet fully mature. We therefore initiated a betterment programme for our completed nuclear power projects, immediately following the handing over of the units from the construction people to the operation and maintenance group. The betterment programme pays off handsomely, resulting in improved availability and capacity factors for the facilities. . .

Looking ahead into the future

It is essential that our serious energy problems should be solved effectively. Like many other countries, Taiwan will continue its Light Water Reactor Programme up to the turn of the century. The technology is proven. Its relative economy, as compared to fossil fuel power generation, has been well established. It is the best way of escaping from the difficult consequences of the prolonged oil crisis.

The volatility caused by economic constraints and perceptions is reinforced by the other major cause of instability, uncertainty. . . Changing economic conditions, evolving patterns of industrial activity, and shifting population, make it impossible for utilities to forecast accurately future electricity needs, particularly in view of the long lead times involved. Changes in government licensing requirements, improvements and changes in engineering design, and other technological factors add to the uncertainty.

. . . Uranium exploration is still as much an art as a science; and even when deposits are discovered, there still remains a great deal of uncertainty about the size, grade and nature of the ore body until detailed drilling or, in some cases, experimental mining has occurred. The development process is also uncertain, with changing government and environmental regulations and technical difficulties often extending development lead times.

. . . Decisions often have to be revised in the light of new economic forecasts, demand projections or ore reserve values; while actual results may be very different from those predicted . . . The result is that inequalities invariably develop between supply and demand, no matter how careful the planning and coordination may have been. . .

Historically, supply and demand in the uranium market have been almost continually out of balance . . . Over the period 1970 to 1981, supply has consistently exceeded demand, leading to a continued increase in inventories . . .

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. . . relative inventories have, in general, increased significantly since the early seventies from a level of 2.6 years to over 4 years.

The changes which have occurred in the level of relative inventories correlate quite well with uranium market developments during the seventies. This confirms that the level of relative inventories is interrelated with the volatility displayed by the uranium market.

The uranium market to 1995

Using the above analysis as a basis, what can be expected looking forward to 1995?

Changes in the level of uranium utilization are indeed likely as the uranium market develops. . . utilities with enrichment contracts in the United States are already taking advantage of the flexibility in their contracts to change the tails assay. . .

. . . inventories of enriched uranium will grow substantially over the next five years or so because of the contracts utilities already have with enrichment facilities. Some market commentators have assumed that this will not lead to lower natural uranium demand, because utilities will continue to need natural uranium to supply their enrichment uranium, a commodity that so far has not had a ready market. However, while this may have been the case up till now, secondary markets are beginning to develop for SWUs. In this way some enriched inventories will be redistributed, thereby reducing primary uranium demand. The pressure for such transactions comes from the high cost of holding enriched inventories, and the transactions are facilitated by flexibilities in enrichment contracts. While this increased fluidity of inventories could be disruptive of the market in the short-term, it could have long-run benefits by hastening the balancing of supply and demand.

Bob Wolcott Nuexco	**Uranium: an uncertain market**

Mr. Wolcott's speech was reprinted in its entirety as an Insert to Nuexco Report 169 of September, 1982.

J.A. Clay, European Economic Community	**Past attempts to stabilize other commodity markets**

The general idea behind attempts to stabilize commodity markets is . . . the wish to avoid widely fluctuating prices — which on the whole make life difficult . . . for miners, . . . for consumers, and for governments . . .

. . . political action and the activities of commodity markets mix extraordinarily badly. Moreover, if the political action is . . . international, then matters are . . . usually worse.

. . . the basic economic theory underlying commodity market operation is by no means clear-cut or agreed. This means that widely differing concepts and policies can surface at the national policy level, and can change radically at the same national level when new people get involved. . .

Then the basic mechanisms of the various commodity markets . . . are not easily understood by civil servants . . . and very few politicians have made the grade at all. . .

. . . What, then, are people trying to do when they propose to stabilize commodity markets? Are they really trying to keep prices stationary; or stationary after allowing for inflation; or fluctuating to a *small* degree around their average, etc. . . . As a final comment on political attitudes to commodity market problems, I would say that a judgment . . . such as: "our aim is to secure adequate supplies of copper (or any other commodity which is traded on world markets) at prices remunerative to producers and fair to consumers" is a poor way of stating the problem; it is light-years away from hinting at anything in the nature of a solution.

Let us . . . pass on to the practical commercial and economic problems of stabilizing commodity markets. One way is to stabilize the price in various ways when a particular LDC (less developed country) suffers from low world prices or from some national disaster involving transport or other investment facilities. . .

Another approach, to [reduce] . . . the output from producers, is what the classical free-market is supposed to produce of its own accord. It still does to a considerable extent in North America, . . . but this market discipline hardly operates . . . where governments require their mining and smelting industries to produce more, not less, in the face of falling prices in order to maintain export income. . .

. . . some are tempted by the idea that a meeting could fix a fair price if only producers' costs could be revealed. . . . this, . . . is a blind alley. . . while all kinds of items can find their way into costs, the most obvious interloper . . . is local taxation, which is simply the number the Minister of Finance last thought of. Costs are indeed relevant; but they operate through the market's supply curve.

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In general the market produces in the short term a market clearing price at any given time, and there is great merit in this. What the market does not do is to compensate for the basic problem of the world commodities — namely, that supply is rather inelastic. . . you cannot open a mine in 12 months; but you also cannot quickly and easily reduce production when the market weakens. . .

Tin is the only metal which is subject to an intergovernmental commodity scheme designed to stabilize its price. . .

Among the "soft" commodities there are intergovernmental schemes covering coffee, cocoa and rubber. . .

Conclusion

. . . Given that many government and inter-government schemes to stabilize commodity markets have failed, and given that many industry schemes are now likely to be illegal in one country or another, what should our policy be?

The fundamental problem is still the inelasticity of supply. The basic possibilities, therefore, are, first, some restriction of supply (either production or exports) in times of recession, in order to avoid over-reaction of price and unnecessary closing of capacity. This restriction of supply is a painful process, but not so painful as what happens if no action is taken. . .

Another contribution to the problem would be the setting up by any consumer government of a national buffer stock, which would be used to purchase supplies when prices were low, and to sell to its own nationals when prices were high, on any price and quantity basis which seemed good to that government. No coordination (beloved of international civil servants) would be needed or desirable, and the more governments that followed the idea in their own private way, the better. Under such a system surpluses could well be taken off the market when desirable, and stocks returned to the market when deficits began to appear. Such a scheme would put considerable pressure on governments, one would hope, to get good market advice from their own traders, producers and consumers.

Jim Bonny and Murray Fulton, Saskatchewan Mining Development Corp.

The Uranium Equation in 1982

A year ago, when the Institute's Supply and Demand Committee reported to this Symposium on its second supply and demand report, the comment was made that since the initial report appeared in 1979, conditions in the uranium market had radically changed. Now, a year later, conditions are still changing. Estimates of forecast nuclear generating capacity have been further reduced, resulting in lower estimates of uranium requirements. Production cutbacks continue to be announced, reflecting perceptions that price recovery will not be immediate, and that unfilled short-term demand is vanishing. Inventory levels have increased, despite selling efforts by some utilities on the spot market. Finally, spot uranium prices have taken another dramatic move downward, following a period of stability (in current US dollar terms) during the latter half of 1981.

. . . an update of the supply and demand estimates . . . form(s) the basis for Part I of this paper, which is presented on behalf of the Supply and Demand Committee. Part II, which discusses certain perspectives on these forecasts, gives the personal views of the authors.

Part I: The Uranium Balance — 1982 compared with 1981

. . . Continued cancellations and deferrals of reactors, combined with few new orders, account for the reduced forecasts of nuclear generating capacity in the years to 1995.

. . . In the period prior to 1987, uranium requirements remain essentially unchanged from the 1981 forecast, even though generating capacity is forecast to decline. The reason is the delay in bringing reactors on stream which had been originally planned for pre-1985; they now fall into the period 1985-1988. The first cores associated with these reactors result in *increased* uranium requirements relative to forecast capacity.

On the supply side, changes have also occurred . . . Most noticeable is the increase in production capability from operating facilities, as projects have moved from the construction phase to the operating phase. This increase ranges from 2600 tonnes U (6%) in 1982 to 5600 tonnes U (15%) in 1990, and is due to the coming on stream of Ranger (Australia), the attainment of full operation by Cluff Lake (Canada), and increases in productive capacity in France, Gabon and South Africa. Canada and the United States show a net reduction in productive capacity, as a result of announced cutbacks and shutdowns; these have taken place throughout the United States, while in Canada two mines have shut down their operations.

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The combined capacity of production facilities operating and under construction has decreased slightly relative to the 1981 forecast. The broad picture is that production capacity has been reduced by 1500 to 2000 tonnes U, suggesting that while severe cost pressures have reduced actual production, particularly in the US, there has not yet been a substantial reduction in production capacity . . . However, no new mines have entered the construction phase.

. . . For producers, cash flows have been reduced due to weak markets in all minerals, including oil and gas, as well as uranium. This, combined with high interest rates and high inflation, has led to cuts in production and exploration and to delays in development. . .

. . . Actual production will differ from (production capacity) to an extent depending on the actual cost/price relationship, contract commitments, and other such market factors.

Despite all these changes, the main conclusion from last year's report, namely that sufficient production capacity will be available to supply the *existing* reactor programme at least until 1995, still holds. . .

Part II: A perspective on the uranium equation

. . . the changes which are continuing in the uranium market, . . . highlight what has long been known: that the market is extremely volatile. Part II analyzes this underlying volatility; comments on the significant impact of stockpiles; and concludes with some observations on how the instability might be minimized.

Economic factors

. . . worldwide exploration expenditures on uranium have historically been influenced by the state of the uranium market, as represented by the constant dollar spot market price (i.e., the Nuexco Exchange Value). Such changes in activity almost invariably lead to results that are dramatically different from those foreseen in even the most rational of plans. The result is market volatility, for under such conditions it becomes highly unlikely that supply will equal demand.

While market forces serve to bring supply and demand into balance, conditions have often changed by the time they act, thereby stimulating new and different influences. . .

. . . The average lead time for uranium mines brought into production before 1960 was about five years. For mines brought into production after that date, the average lead time has been . . . in the range of 10-25 years. The average lead time for reactors in the western world has been approximately eight years, with a normal distribution around this figure. The average lead time for the United States has also historically been eight years: although, in contrast, the anticipated average lead time for reactors now under construction is 10-12 years.

R.S. Livingston,
Australian Uranium
Export Office

Can Market Stability be Improved? Government and Export Contract Approvals

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Detailed price information relating to deliveries under long-term contracts has been difficult to obtain in the past; whereas spot-price indicators have been published for years by Nuexco and Nukem. One of the consequences of the lack of price information in the long-term market is a tendency by the industry to focus on the spot-price indicators and to refer to them as barometers of the total market. While this tendency is understandable in the absence of other readily available data, it is desirable to make some cautionary observations on the growing pressures on producers to use these spot-market indicators for pricing purposes under long-term contracts, particularly in the US market.

At the time of drafting this paper, the Nuexco Exchange Value had fallen to $19.25. There is no doubt in my mind that adoption of this price for the bulk of their deliveries would place almost all producers in the fast lane to bankruptcy, and would foreclose on most future projects, with predictable consequences for long-term supply and industry stability.

This is not to imply that the spot market is irrelevant. . . . but it must be recognized that its role is limited. We can all accept that there is a price which will equate long-term supply and demand; but there is no compelling reason for believing that spot prices at a particular time bear any relation to that long-term equilibrium price.

We believe that the wide adoption of spot prices is incompatible with the objective of long-term stability. We view with concern recent developments in the US market, which appears to be more directly influenced by spot prices than markets elsewhere. The industry in that country seems to be reacting to typical 'boom/bust' conditions, an extremely inefficient and costly process for producers and consumers alike.

. . . commodity markets . . . are nearly all subject to substantial price fluctuations, due in the main to the fact that marginal supply surpluses or shortages tend to have a disproportionate effect on prices on the relevant commodity exchanges. . .

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. . . it can be argued that the instability of the relatively new commercial uranium market has been due to rather special circumstances which should not be repeated in the future.

. . . after the 'shake-out' over the past few years construction programmes are firmer, with a more realistic and predictable reactor and enrichment demand over the balance of the decade.

In the circumstances it seems reasonable to conclude that there will be a growing and largely predictable demand for uranium over the next decade or so, which will be mainly uninfluenced by movements in prices. . . There will be differences of opinion as to the long-term equilibrium price; but the parameters of disagreement may be much narrower than is commonly thought.

The import embargo imposed by the USA in 1964 (not yet entirely removed and further restraints threatened) would be described by most objective observers as both misguided and hardly calculated to encourage the development of an efficient and stable international uranium industry.

The export embargoes imposed by the USA and Canada in 1977 did nothing to inspire confidence in the security of contractual relations between producers and consumers. An unfortunate aspect of these actions was the attempt to apply retrospectively new conditions to trade under existing contracts.

A major objective of our export control policies is to ensure that, . . . Australia receives a fair and reasonable return for sales of its resources. . .

With regard to uranium, this common policy objective translates into a requirement for contracts to provide for fair market prices to be received over their duration. Such prices are negotiated between buyer and seller, and should have proper regard for long-term factors and keep short-term factors in perspective. Such an approach should result in market prices more consistent with the 'economic incentive' price which the Institute's own analysis has concluded is an essential prerequisite for a balance of supply and demand over the longer term. We see this approach as one which contributes significantly to stability and orderly development in resource industries.

. . . However, in view of the volatility which has, at least to this time, characterized the uranium industry, it was considered appropriate to underpin this more general objective with a requirement for a floor price mechanism.

Reginald Worroll, Chamber of Mines of South Africa	**Producer Viewpoint relative to Market Stability**

1. . . . while the instability in the uranium market affects both producer and consumer, it is the producers who, for the most part, have to withstand the pressures which such instability brings about. . . As I see it, it is the lack of stability in the demand side of the equation which is the prime cause of the problem. . .

2. The uranium mining industry cannot survive without the nuclear power industry and without uranium mines there would be no nuclear power. . . the industry should be able to introduce into the arrangements under which trade in uranium is conducted policies and practices which may not be feasible in other areas of commercial activity.

3. The answer we are all seeking is where do we go to find the key to the stabilization of uranium prices? . . . I am not encouraged by what Mr. Clay has told us — producer prices, buffer stocks, export quotas, and the like, are not likely, if the experience elsewhere is any guide, to be as successful as one might hope.

4. While I claim to be an exponent of free enterprise, I hesitate to subscribe, without reservation, to the view expressed by Mr. Wolcott "that the best solution to market stability will evolve out of a free market." He warns that there will be pain for the supplier and that the pain is unavoidable. You will understand that as a supplier I find it a little difficult to accept this conclusion with equanimity. I think we should strive to find something to relieve the pain when the going gets rough, at which time also the suppliers will need the help and understanding of their trading partners, the utilities.

6. The difficulty of specifying in advance a fair and reasonable price for uranium under a long-term contract has been borne out by our experiences in the past. . . Because of these difficulties the market concept has come to be applied on a fairly wide scale. By this means the parties are able, by negotiation, to determine a price, usually on an annual basis, which is considered to be consistent with current market conditions resorting; in the event of disagreement to the determination of a market price by an independent arbitrator or expert. . . Unconsciously, perhaps, we have also developed a tool which I believe could be used on a broader basis given good faith and understanding between the contracting parties to cushion the shocks transmitted by an unstable market.

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7. This would be a fundamental change in the market price concept and it would not be appropriate to continue to describe it as such. Rather, it becomes a "negotiated price" arrived at not only on the basis of an assessment of prevailing market conditions, but having regard also to other, possibly subjective, factors which the parties consider it necessary or desirable to take into account. Under this kind of arrangement there might not be much room for arbitration in the event of disagreement, since an arbitrator would find it difficult to adjudicate on subjective factors in the minds of the parties. This difficulty can be overcome and at the same time a measure of discipline can be added to the negotiated price concept by the adoption in conjunction with it of a floor price and a ceiling price each pitched at a level designed to protect the legitimate interests of the parties; and at the same time to provide an effective brake on price instability.

8. . . . The concept is simply enough. Its translation into practice may be somewhat more difficult, but I firmly believe that where producers and consumers are ready to come together under long-term supply contracts the concept is feasible and workable. . .

UNITED STATES

Two US producers received licenses for uranium mills:

1. Pioneer Uravan received a license for its planned Slick Rock, Colorado mill. Pioneer has no current plans for developing the mill, preferring to wait for an improved uranium market.

2. The Seboyeta, New Mexico mill, part of the Sohio Western Mining Company (Sohio) L-Bar Ranch uranium operation, was relicensed for an additional 5 years, although it is presently closed.

* * *

Sohio and Reserve Oil & Minerals Company (Reserve), originally joint venture partners in the L-Bar Project, have resolved their differences in a complex settlement under which Sohio became the sole owner of the mine, mill and U_3O_8 inventory, assumed certain of Reserve's debts, and forgave certain amounts owed to it by Reserve. Other considerations included cash payments, and transfers of land, royalties, surface and mineral rights. Sohio has no plans to operate the mill until the market improves.

* * *

South Carolina Electric and Gas Company began loading fuel for its Summer nuclear unit, with hopes of commercial operation by year end. Five utilities have received operating licenses for nuclear units so far this year:

Utility	**Reactor**	**License**
Commonwealth Edison Co.	LaSalle Unit 1	Full power
Pennsylvania Power & Light Co.	Susquehanna Unit 1	Low power
Southern California Edison Co.	San Onofre Unit 2	Full power
Mississippi Power & Light Co.	Grand Gulf Unit 1	Low power
South Carolina Electric & Gas Co.	Summer	Low power

These units represent approximately 5,400 MWe of generating capacity. The corresponding increase in US consumption of U_3O_8 is on the order of two million pounds per year.

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MARKET DATA

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Available for Sale:			
ACTIVE			
1575		500 per year	Long Term
1610	50		
1920	2,000		
1925	500		UF_6
1932	200		
1970	40		UF_6
1976	180		
1986	40		
2009	50		
2014	250		
TOTAL:	3,310		
INACTIVE			
1581B		100 per year	Long Term
1774	50		
1804	615		
1805		500 per year	Long Term
1818		250 per year	Long Term
1877	50		
1928	1,000		UF_6
1951	1,250		
TOTAL:	2,965		

[1] Measured from the date of this Report

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URANIUM DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8)		Remarks
	0 to 1 Year	Beyond 1 Year	
Inquiries to Purchase:			
ACTIVE			
1638		250 per year	1983-89
1843	250		
1871		250 per year	1983-86
1915		500	UF_6
2004	100		
2005		1,000	
2009	50		
2010		400 per year	1984-92
2014	160		
2020		300 per year	1984-93
TOTAL:	660		
INACTIVE			
1459		200 per year	Long Term
1652		200 per year	Long Term
1888		500 per year	Long Term
1923	30		
1935		400	
1963		180	
1966	100	200	
1978	200	200	
1979	30	175 per year	1983-87
1995	300		
1996		420	
1999		50 per year	1985-90
TOTAL:	660		

[1] Measured from the date of this Report.

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CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
ACTIVE			
1609	500	1,500 per year	Long Term
1925	450		
2008	800	800	
TOTAL:	1,750		
INACTIVE			
1619	250	250	
1902			
1936	200	350	
1983	415	200 per year	Long Term
TOTAL	865		

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U as UF_6)		Remarks
	0 to 1 Year	Beyond 1 Year	
ACTIVE			
2018	100		
TOTAL:	100		
INACTIVE			
1594	400	450 per year	Long Term
1622	250	700	
TOTAL:	650		

[1] Measured from the date of this Report.

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MARKET DATA

LOAN SUPPLY AND DEMAND

Nuexco Reference Number	Delivery Period[1] (Thousands of Pounds U_3O_8) 0 to 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
ACTIVE			
1815	1,000		
1884	275		
1938	2,000		
1939	800		
TOTAL:	4,075		
INACTIVE			
1910	1,000		
1919	2,000		
1931	600		
TOTAL:	3,600		
Inquiries to Borrow:			
ACTIVE	None		
INACTIVE	None		

[1] Measured from the date of this Report

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CURRENT TRANSACTIONS[1]

Uranium Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current E.V.	Seller	Buyer	Remarks
1943	1982	51-100	100	US Producer	US Producer	
1950	1982	101-300	Less than 99	US Utility	US Producer	
1953	1982	Less than 50	99	US Producer	US Producer	
1959	1983	101-300	Less than 99	US Utility	US Utility	UF_6
1962	1982	101-300	Less than 100	US Utility	Unknown	UF_6
1965	1982	301-600	Less than 99	US Utility	US Producer	Some UF_6
1966	1983	101-300	99	US Utility	US Utility	

Conversion Transactions

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as Percent of Current C.V.	Seller	Buyer	Remarks
1946	1983	101-300	91	US Utility	US Utility	
1967	1983	Less than 50	77	US Utility	US Utility	

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[1] Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.

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COMMENTARY

THE US URANIUM IMPORT EMBARGO ISSUE

Summary

The prospects for a US uranium import embargo are highly uncertain. Final consideration of the proposed legislation has been deferred until the post-election session of Congress. Consequently, the next six to eight weeks are of most immediate interest. It is Nuexco's opinion that most, if not all, potential US buyers of uranium will await further developments rather than risk contracting long-term for *any* uranium in the current circumstances.

The entire issue is characterized by uncertainty. It is not even clear that the proposed measure, if enacted, would provide the desired benefits to US producers. In Nuexco's opinion, the outlook would be for continued uncertainty if the measure were passed, because its commercial effects would depend on how and by whom it were administered. The result would be a continuing planning nightmare for US utilities and producers.

Status of Legislation

The prospects for US passage of meaningful uranium import embargo legislation remain highly uncertain. During September, a House-Senate conference committee adopted a measure designed to limit US imports of uranium to 37.5 percent of actual or projected domestic uranium requirements. However, several influential members of the House of Representatives have since announced their opposition to the measure. Several members even sent a letter to other Representatives in which they opposed the measure, primarily on the grounds that it would adversely affect US foreign relations. There is also speculation that President Reagan would veto any such legislation. Final consideration of the embargo measure by the House of Representatives has been deferred to the post-election session of Congress, so the next six to eight weeks are of most immediate interest.

Effect on Procurement Strategy

Uncertainty over whether an embargo will be enacted and, if enacted, what the ultimate effects will be make it very difficult for producers and utilities to plan their marketing and procurement activities. The dilemma faced by each potential buyer of uranium — whether to execute a purchase contract at the present time or to await future developments — is particularly acute now that an embargo is so close, yet so far away.

Consider three possible courses of action:

1. A US utility could execute within the next six to eight weeks a long-term contract for the purchase of relatively low-priced Canadian uranium. A utility executive could argue that now is the time to buy, since contracts executed before passage of the embargo legislation would be honored (grandfathered). However, there is always the possibility that any import restrictions would somehow be applied to all utilities, regardless of when their import contracts were signed. Therefore, such a course of action would not be risk-free.

2. A US utility could execute within the next six to eight weeks a long-term contract for the purchase of relatively high-priced *US origin uranium*. A utility executive could argue that, since other US utilities would be forced by the embargo to buy US uranium, he could obtain the lowest price for domestic supplies by buying now. This strategy carries the risk that no meaningful embargo will be enacted. If so, the utility would have needlessly obligated itself to pay more than the spot market price for uranium deliveries, something they are generally reluctant to do.

3. A US utility could await further developments. If no meaningful embargo is passed, a utility will still be able to buy uranium under terms and conditions similar to those of the current market. The fundamental aspects of supply and demand will not alter drastically in the next six to eight weeks. If a meaningful embargo is passed, then a utility will have ample justification for paying whatever price is necessary to acquire the needed uranium. In either case, this strategy is virtually risk-free and, in Nuexco's opinion, is likely to prevail in the ensuing weeks.

What If the Proposed Measure is Enacted?

Even if the proposed embargo legislation became law, it would still be rife with uncertainty; for example:

1. The final language is not yet known. Although a text has been released, the legislators' staffs were given authority to make editorial changes for the purpose of clarification. Given the ambiguous wording of so much of the embargo measure, "editorial changes" could very well change the substance of one or more provisions, intentionally or otherwise.

2. The proposed language refers to "executed contracts," but it does not mention *when* a contract would have to have been executed in order to qualify for grandfathering.

3. If, at any time, the Energy Secretary determined that executed contracts or options for imports of foreign-source uranium represented more than 37.5 percent of actual or projected domestic uranium require-

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COMMENTARY

ments for any two-consecutive-year period, then the Secretary would be required to "immediately revise criteria" for USDOE enrichment services to enhance the use of domestic origin uranium. It has yet to be determined how the 37.5 percent limit would be measured. Furthermore, it is unknown what actions the Secretary might take to "enhance" the use of domestic uranium.

4. It would require the projection of numerous industry measures, such as:

a. uranium requirements and inventories of domestic utilities;

b. present and future uranium production by the domestic mining and milling industry;

c. present and future probable penetration of the domestic market by foreign imports;

d. the size of domestic and foreign ore reserves;

e. present and projected domestic uranium exploration expenditures and plans;

f. present and projected employment and capital investment in the uranium industry, etc.

None of the projections listed above would be simple. The assumptions used in each analysis would be critical. Respected analysts could easily reach diametrically opposed conclusions. Therefore, the conclusions would be subject to manipulation by whoever was chosen to perform the analyses, and also by the administration. What purported to be objective reports would become instruments of political policy.

5. Industry-wide measurement of the chosen criteria would make individual utility planning practically impossible. A uranium import contract signed at one time might help to trigger the 37.5 percent limit at some later date. Furthermore, the time lags inherent in the system for reporting and administration would make contracting much more uncertain.

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ESSAY

THE FUTURE OF THE US URANIUM PRODUCTION INDUSTRY

The continuing viability of the US uranium production industry is essential to US utilities' desire for assured future supplies of *domestic* uranium. However, for the past several years, they have been struggling with the choice between two mutually exclusive alternatives:

1. To obtain security of domestic supply by agreeing to long-term contract prices which are high enough to ensure that viability;
2. To obtain relatively low-priced material by relying more on the spot market, but at the cost of accepting greater market uncertainty and the risk that spot prices may rise suddenly.

Unfortunately for many US uranium producers, US utilities have often chosen the second option, with its resulting short-term downward pressure on spot prices.

The conventional relationships between supply and demand are but one aspect of today's uranium market. Beginning in 1980 and continuing to date, utilities liquidating inventory in competition with producers selling uncommitted production have exerted enormous pressures on the spot and near-term markets. While utility inventory sales have eased somewhat of late, recent reactor cancellations and deferrals suggest that additional such sales are inevitable, and will continue to compete with primary supply and maintain pressure on prices in the spot and near term.

This perceived availability of material, together with the forecasts that worldwide supply will continue to exceed consumption through 1990, suggest the continuation of a buyers' market for some time. US utilities in particular are reluctant to enter into long-term contracts that are not related to spot price. Their experience with contracts having base-escalated prices in the mid and late 1970s (some current delivery prices are more than triple the current spot price) has made them extremely cautious.

Producers, particularly those higher cost US producers, require, on the other hand, prices related to or in excess of their variable production costs. In many cases, current spot price levels will not suffice. Only perceived shortages (unlikely) or higher prices for long-term supply will allow these producers to survive. Even though currently worked reserves are being depleted and shut down, little new uranium development can be expected in the US without new high-grade finds.

Table 3 is a list of currently operating US uranium mills and their nominal capacities. Some of those listed have already announced shutdowns by year end 1982 or for 1983. In addition, at least two others are considering or have actually initiated open market purchases, perhaps in anticipation of shutting down or cutting back production.

The US uranium industry is near the end of its second price cycle. The industry is in contraction resulting from decreased demand, weak prices, and competition from its own customers. Eventual price recovery appears likely, but the timing is far from certain. If market participants can learn enough from the painful lessons of the first two price cycles, it should be possible to avoid over-contracting and, in so doing, reduce the likelihood of still another cycle of boom and bust.

Table 3

1982 OPERATING US URANIUM PRODUCERS NOMINAL PRODUCTION CAPACITY (thousands of tons per day)

Mill	**Capacity**
CONVENTIONAL	
Atlas Minerals Corp.; Moab, Utah	1,400
Chevron Resources; Panna Maria, Texas	2,500
Cotter Corp.; Cañon City, Colorado	1,200
Dawn Mining Co.; Ford, Washington	500
Energy Fuels; Blanding, Utah	2,000
Exxon Minerals; Powder River, Wyoming	3,200
Homestake Mining Co.; Grants, New Mexico	3,400
Kerr-McGee Nuclear; Grants, New Mexico	7,000
Union Oil; Sweetwater, Wyoming	3,000
Pathfinder Mines Corp.; Gas Hills, Wyoming	2,500
Pathfinder Mines; Shirley Basin, Wyoming	1,800
Petrotomics Co.; Shirley Basin, Wyoming	1,500
Rio Algom Corp., La Sal, Utah	750
Rocky Mtn. Energy; Bear Creek, Wyoming	2,000
Union Carbide Corp.; Uravan, Colorado	1,300
Union Carbide Corp.; Gas Hills, Wyoming	1,400
Total Operating Capacity — Conventional	35,450

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ESSAY

1982 OPERATING US URANIUM PRODUCERS
(thousands of pounds U_3O_8 per year)

Mill	Capacity
UNCONVENTIONAL	
Solution Mining:	
Caithness Corp.; Bruni, Texas	250
Conoco; Treviño, Texas	400
Everest Mineral Corp.; Las Palmas, Texas	250
IEC Corp.; Ray Point, Texas	250
Nufuels Corp.; El Mesquite, Texas	700
Nufuels Corp.; Ohern, Texas	200
Ogle Petroleum; Bison Basin, Wyoming	400
Tenneco; West Cole, Texas	300
Uranium Resources Corp. (URI); Bruni, Texas	100
URI-Framco-Conoco JV; Benavides, TX	400
US Steel Corp.; Burns Ranch, Texas	1,000
US Steel-NM Uranium; Clay West, Texas	1,000
Phosphoric Acid By-Product:	
Earth Sciences, Inc.; Calgary, AL	120
Freeport U. Recovery Corp.; Uncle Sam, LA	750
Freeport U. Recovery Corp.; Sunshine, LA	420
IMC Corp.; New Wales, Florida	900
IMC Corp. @ CF Industries; Plant City, FL	650
IMC Corp. @ CF Industries; Bartow, FL	650
Heap Leaching:	
Anamax Mining Co.; Sahuarita, Arizona	140
Wyoming Mineral Corp.; Bingham Canyon, UT	125
Total Operating Capacity—Unconventional	9,005

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MARKET ANALYSIS

US INVENTORY COMPOSITION

DOE's July 1982 "Survey of United States Uranium Marketing Activity" indicates a change in US uranium inventory position seemingly inconsistent with Nuexco's previously published analysis. Table 2 below, based on DOE data, indicates inventories held by "ALL BUYERS" actually declined last year.

Table 2

URANIUM INVENTORIES HELD BY US BUYERS (millions of pounds U_3O_8 equivalent)

	ALL BUYERS		UTILITIES	
	As of 1/1/81	As of 1/1/82	As of 1/1/81	As of 1/1/82
Natural Uranium	90.2	102.4	75.4	88.2
Enriched	36.6	22.4	33.4	17.4
TOTAL	126.8	124.8	108.8	105.6

Nuexco Report 159 of November 1981 forecast a US supply excess — Production minus Consumption minus Net Exports — of 14.5 million pounds U_3O_8 equivalent. Since buyer inventories actually declined by 2.0 million pounds U_3O_8 equivalent, there is an apparent inconsistency of 16.5 million pounds U_3O_8 equivalent between Nuexco's forecast and the DOE data.

Two factors account for virtually all of the difference:

1. Producer inventories increased;
2. Fabricated fuel inventories increased.

Historically, producers have milled little beyond what was needed to fulfill contractual commitments and to make some spot sales. It has only been in the last few years that producer inventories have become a noticeable part of the total. Incorporating producer inventories into Table 2 yields Table 3, showing US *commercial inventory* at the beginning and end of 1981.

Table 3

US COMMERCIAL URANIUM INVENTORY (millions of pounds U_3O_8)

	As of 1/1/81	As of 1/1/82
Natural Uranium		
All Buyers	90.2	102.4
Producers	5.4	14.0
Enriched Uranium	36.6	22.4
TOTAL Commercial Inventory	132.2	138.8

Table 3 indicates US producer inventory increased by 8.6 million pounds U_3O_8 during 1981. As a result, US commercial uranium inventory increased by a net of 6.6 million pounds U_3O_8 equivalent, leaving 7.9 million pounds still unaccounted for.

Thus, increases in producer inventories account for approximately half of the difference. The remainder is attributable to increases in inventories of fabricated fuel:

1. Nuexco's inventory estimates customarily include ". . . uranium (U_3O_8, natural UF_6, enriched UF_6) owned by utilities, reactor manufacturers, fuel fabricators and national organizations which procure uranium for commercial purposes.
2. An important assumption used by Nuexco in calculating Apparent Future Consumption (AFC) is that ". . . U_3O_8 deliveries for first cores predate commercial operation by two years."
3. Nuexco's estimate of 1981 consumption included fuel for operating reactors as well as that going into the pipeline for three first cores. The NRC estimate of schedule for issuance of operating licenses listed 17 reactors which could receive an NRC operating license in 1983.
4. Applying Nuexco's AFC assumption to each of the 17 reactors, the potential "Apparent Future Consumption" for first cores alone in 1981 could have been 15.6 million pounds.

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5. In 1982, for the first time, DOE requested that utilities supply information on their inventories of fabricated fuel. The total as of January 1, 1982 is 20.4 million pounds U_3O_8 equivalent.

It is now apparent that more utilities than previously expected have first cores being fabricated. It is most unlikely that all 17 reactors on the NRC list actually will be licensed in 1983; some are shown as less than 80 percent complete as of June 30, 1982. However, for various reasons, some utilities have chosen to have first cores fabricated well in advance of certain need, accounting for a 7.9 million pound drop in commercial inventory.

This accelerated movement of enriched uranium into fabrication does not change the overall consumption of the US nuclear industry. It represents only a shift in the annual amounts, decreasing consumption in the next few years as first cores actually fabricated in 1981 and 1982 are deleted from 1983 and 1984 consumption estimates. Thus the 1981 decline in inventory does not represent a change in the uranium supply-demand imbalance which has kept pressure on spot market uranium prices. Nuexco continues to project worldwide uranium supply in excess of consumption for the rest of the decade.

THE VARIABLE TAILS ASSAY OPTION: ITS EFFECT ON NATURAL URANIUM CONSUMPTION

Discussion

The Variable Tails Assay Option (VTAO) which US DOE allows its customers holding Adjustable Fixed-Commitment (AFC) contracts, *could* theoretically increase natural uranium feed requirements by approximately eight million pounds U_3O_8 over the two-year period ending September 30, 1984 (FY83, FY84). However, in Nuexco's opinion, such a large increase will not be realized. Many of the SWUs covered under elections of 0.30 percent tails assay (TA) are intended for resale in the secondary SWU market. It is Nuexco's opinion that at least 900,000 SWUs at 0.30 percent TA [equivalent to 262,774 kg U as UF_6 (3 percent enriched)] will be resold to parties who will have either partially terminated Requirements contracts, or will be above their Requirements contract Appendix A ceilings.

Those cancellations and substitutions will eliminate an equivalent amount of enriched product [262,774 kg U as UF_6 (3 percent enriched)]. At 0.20 TA, that quantity would have required 1,131,504 SWU and 1,439,737 kg U as UF_6 natural feed material (or 3.76 million pounds U_3O_8). Thus, in Nuexco's opinion based on a very conservative projection, secondary SWU market transactions will offset almost 50 percent of the apparent increase in natural uranium feed requirements associated with the VTAO.

Calculation of VTAO's Potential Effect on Natural Uranium Consumption

Table 4 lists the quantity of SWUs specified at each of the allowed transaction tails assays, other than those at 0.20 percent U_{235}, during each year of the four-year period beginning with FY81. Each year, the total rose substantially, and the trend was toward higher tails assays.

In order to calculate the amount by which the VTAO *might* increase uranium consumption, it is necessary to compare the theoretical uranium consumption for a given enrichment at 0.20 percent U_{235} against that at a given tails assay (TA). The following example uses 0.30 percent tails assay and 3.0 percent product enrichment:

1. Feed component for 0.30 percent TA = 6.569 Kg U in UF_6 (natural) per Kg U in UF_6 (3 percent enriched).
2. SWU component for 0.30 TA = 3.425 SWU per Kg U in UF_6 (3 percent enriched).
3. Ratio of Feed component (0.30 TA) to SWU component (0.30 TA) = [6.569/3.425 = 1.918] Kg U in UF_6 (natural) per SWU.
4. Feed component for 0.20 percent TA = 5.479 Kg U in UF_6 (natural) per Kg U in UF_6 (3 percent enriched).
5. SWU component for 0.20 percent TA = 4.306 Kg U in UF_6 (natural) per Kg U in UF_6 (3 percent enriched).
6. Ratio of Feed component (0.20 TA) to SWU component (0.20 TA) = [5.479/4.306 = 1.272] Kg U in UF_6 (natural) per SWU.
7. Subtracting step 6 from step 3 yields [1.918 − 1.272 = 0.646] Kg U in UF_6 (natural) per SWU.
8. Convert to U_3O_8: 0.646 Kg U in UF_6 (natural) times 2.61284 pounds U_3O_8 per Kg U in UF_6 (natural) = 1.687 pounds U_3O_8 per SWU.

Therefore, *for a fixed quantity of SWU*, and assuming 3.0 percent enrichment, each SWU at a tails assay of 0.30 percent U_{235} would use 1.687 pounds U_3O_8 more than a SWU at 0.20 percent U_{235}. The corresponding changes in feed requirements for each of the tails assays allowed under the VTAO are listed in Table 5, along with the feed components and SWU components used to derive them.

The changes in feed requirements developed in Table 5, when multiplied by the numbers of SWUs elected in a given year at each tails assay, can be used to estimate the potential impact of the VTAO. For example:

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1. From Table 4, DOE's AFC customers elected 93,929 SWUs at 0.16 percent TA in FY81.

2. Assuming an average enrichment level of 3.0 percent, Table 5 indicates that each SWU at 0.16 percent TA would use 0.533 pounds U_3O_8 *less* than at 0.20 percent TA.

3. Thus, the algebraic product of the VTAO SWUs at 0.16 percent TA (93,929) and the corresponding multiplier (-0.533 pounds U_3O_8 per SWU) yields a *decrease* in requirements of 50,064 pounds U_3O_8.

The corresponding results for each combination of fiscal year and tails assay are shown in Table 6.

Background

USDOE has allowed holders of Adjustable Fixed-Commitment (AFC) contracts to select, commencing with deliveries scheduled for fiscal year ending September 30, 1981 (FY81), tails assays other than the 0.20 percent U_{235} at which DOE operates the enrichment plants.

The portion of the AFC contact providing for the Variable Tails Assay Option (VTAO) — Article II, Section 9 — is quoted below:

"In the event the Customer wishes to obtain during any fiscal year, commencing in Fiscal Year 1981, enriched uranium in such quantities (KgU) and assays (weight percent U_{235}) that would vary from that obtainable, pursuant to the established DOE standard table of enrichment services, from the enrichment services specified for such year in the Appendix "A", the Customer may obtain such enriched uranium by electing the variable tails assay option. Such option is available upon at least fifteen months' notice prior to the fiscal year of the election of such option and is available at least between the tails assays of 0.20 weight percent U_{235} to 0.30 weight percent U_{235}. Additional terms and conditions may be established by DOE from time to time, such as tails assays outside of the 0.20 weight percent U_{235} to 0.30 weight percent U_{235} range, charges associated with selection of such tails assays and tables of discrete tails assays other than the Standard Table for establishing the enriched product to be delivered in accordance with Appendix 'A'."

The "additional terms and conditions" established by DOE with regard to FY83 and FY84 are summarized as follows:

1. VTAO applies to tails assays of 0.16 to 0.30 percent U_{235} (at intervals of 0.01 percent).

2. Customers may allocate their contracted SWUs over any of the allowable VTAO transaction tails assays without extra charge.

Table 4

QUANTITY OF SWUs ELECTED UNDER VTAO[1]
(AT TAILS ASSAYS OTHER THAN 0.20%)

Tails Assay (Percent U_{235})	FY81	FY82	FY83	FY84 Domestic	FY84 Foreign
0.16	93,929	818,776	832,654	8,131	0
0.18	79,639	0	0	0	0
0.19	218,611	93,928	86,745	0	240,066
0.21	67,931	0	0	0	0
0.22	0	401,125	363,765	0	0
0.23	0	242,724	742,630	100,000	0
0.24	0	162,176	0	178,870	482,406
0.25	0	108,095	125,212	0	0
0.26	0	0	790,365	107,503	0
0.27	0	0	163,763	548,445	0
0.28	0	0	276,771	238,101	247,682
0.29	0	0	50,400	0	198,758
0.30	0	0	187,770	2,114,347	212,361
TOTAL	460,110	1,826,824	3,620,075	3,295,397	1,381,273

[1] Source: USDOE

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MARKET ANALYSIS

Table 5

DATA USED IN COMPUTING VTAO POTENTIAL EFFECTS ON FEED REQUIREMENTS

Tails Assay (& U_{235})	Feed Component[1] [kg U as UF_6 (natural) per kg U as UF_6 (3% enriched)]	SWU Component[1] [SWU per kg U as UF_6 (3% enriched)]	Change in Feed[2] Requirements, relative to 0.20% TA [pounds U_3O_8 per SWU]
0.16	5.154	4.824	-0.533
0.17	5.231	4.681	-0.405
0.18	5.311	4.548	-0.273
0.19	5.393	4.423	-0.139
0.20	5.479	4.306	0
0.21	5.569	4.196	0.143
0.22	5.662	4.092	0.291
0.23	5.759	3.994	0.443
0.24	5.860	3.900	0.601
0.25	5.965	3.811	0.765
0.26	6.075	3.727	0.934
0.27	6.190	3.646	1.111
0.28	6.311	3.569	1.296
0.29	6.437	3.495	1.488
0.30	6.569	3.425	1.687

[1] Source: USDOE

[2] Computed as follows:
Multiply 2.61284 lbs. U_3O_8 per kg U as UF_6 times [Feed-to-SWU ratio for the given TA minus Feed-to-SWU ratio for 0.20% TA]

Table 6

POTENTIAL IMPACT OF VTAO ELECTIONS

Potential Increased Feed Requirements[2]

(thousands of lbs. U_3O_8 equivalent)

Tails Assay (% U_{235})	Multiplier[1] (Additional lb. U_3O_8 per SWU)	FY81	FY82	FY83	FY84	
					domestic	foreign
0.16	-0.533	-50.1	-436.4	-443.8	-4.3	0
0.17	-0.405	0	0	0	0	0
0.18	-0.273	-21.7	0	0	0	0
0.19	-0.139	-30.3	-13.1	-12.1	0	-33.4
0.20	0.000	0	0	0	0	0
0.21	0.143	9.7	0	0	0	0
0.22	0.291	0	116.7	105.9	0	0
0.23	0.443	0	107.5	329.0	44.3	0
0.24	0.601	0	97.5	0	107.5	289.9
0.25	0.765	0	82.7	95.8	0	0
0.26	0.934	0	0	738.2	100.4	0
0.27	1.111	0	0	181.9	609.3	0
0.28	1.296	0	0	358.7	308.6	321.0
0.29	1.488	0	0	75.0	0	295.8
0.30	1.687	0	0	316.8	3,566.9	358.3
	TOTAL:	92.4	-45.1	1,745.4	4,732.7	1,231.6

[1] This Report, Table 5

[2] Derived as the product of the multiplier from column 2 and the SWU quantities listed in This Report, Table 4

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RAW MATERIALS

URANIUM OCCURRENCES IN NORWAY

Introduction

Known uranium mineralization in Norway is limited to occurrences widely scattered throughout the country, none of which are of sufficient size and percent U_3O_8 for commercial development at this time. The government sponsors continued uranium exploration in conjunction with programs for other minerals. However, uranium exploration programs are of low priority since Norway does not have a nuclear power program.

The government has considered a long-term power program on at least two occasions, the last being in the mid-1970s when efforts to site the first plant were terminated primarily due to a reduction in the annual growth rate for electric power. Projected demand for electrical energy remains low for Norway and the government does not anticipate a need for nuclear power during the rest of this century.

Exploration History

Norway produced small amounts of uranium in the last quarter of the 19th century. Production was a by-product from the pegmatite mines in the Telemark district of southern Norway. The principal use for the uranium oxide was a coloring agent in manufacturing certain glass products. When the pegmatite mines closed down at the turn of the century, uranium production ceased and has not resumed to this date.

Uranium exploration was initiated by the Norwegian government in the late 1940s through a joint effort of the Norwegian Defense Research Establishment (FFI), the Joint Establishment for Nuclear Energy Research (IFA) and the Geological Survey of Norway (NGU). The purpose of the program was to determine Norway's uranium resource potential for the support of a possible nuclear power program. The joint venture concentrated on known occurrences, including the pegmatite district, and the Cambrian shales in the Oslo region. The overall success of the program included the discovery of a number of small, low-grade occurrences of questionable economic potential. The program was cancelled short of the intended purpose.

The Geological Survey resumed exploration on a small scale in the mid-1950s. Vehicle-borne radiometric measurements were carried out on a systematic pattern throughout areas where the geology was considered favorable. The program apparently met with little success and was abandoned before the end of 1959.

A multi-mineral exploration program was initiated by the NGU in the 1960s. An aeromagnetic survey was completed over practically the entire country on a line spacing of 1KM. Radiometric detection equipment was added for flights over areas with potential for uranium mineralization. A number of radiometric anomalies were located during the survey, but follow-up investigations failed to generate any important uranium prospects.

The most recent uranium prospecting program in Norway was initiated by the NGU in 1975. Again, uranium exploration techniques were included as part of a much broader mineral prospecting program. The program is outlined to general prospecting and mapping for all mineral resources. Air and vehicle-borne radiometric detection equipment has been utilized from the start. Geochemical and stream sediment samples showing indications of uranium are analyzed by fluorimetric methods. Every uranium occurrence discovered is eventually investigated for its economic potential. No commercial uranium deposits have been located to date, however, important occurrences of other minerals have been recorded. The government is continuing to sponsor the program in an effort to broaden the resource base for the country.

General Geology

Precambrian crystalline rocks belonging to the Fennoskandian Shield forms the basic geology of Norway. The Precambrian is exposed in the south, east and north portions of the country. In central and northern Norway, the Precambrian is covered by Paleozoic rocks comprised of metasediments and metavolcanics of Cambrian-Silurian age, and sediments of Devonian age along the southwestern coastline. Jurassic and cretaceous sediments occur along the central coastline and on nearby islands.

The early Paleozoic formations were metamorphosed, folded and faulted during the Caledonian Orogeny dating about 400 to 600 million years. The highly disturbed rock sequence forms the Caledonian mountain chain that extends along the full length of the Swedish border and continues under the North Sea to surface again in Scotland and Ireland.

Precambrian basement rocks of the Fennoskandian Shield were structurally affected by the Caledonian Orogeny and are now exposed through tectonic/erosional "windows" that occur at random along the Caledonian mountain chain. Many uranium occurrences of Norway are found in folded rocks of the Caledonian mountains,

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particularly in the Precambrian windows. (A window is formed when a portion of surface rock has eroded away exposing underlying older rocks. The Olden Window discussed in Nuexco Report 169, page 22, is a classic example of a geologic window.)

Prospecting is made difficult by the extensive cover of glacial drift throughout central and northern Norway, especially along the more favorable Caledonian mountain front. Prospecting is initiated by utilizing a variety of radiation detection equipment in glacial areas, the most effective being till-spectrometry. Airborne and ground geophysics are used to detect surface and buried geological features that are favorable to mineralization. Once a prospect has been identified, follow-up evaluation includes detailed geophysical and geochemical work, trenching and extensive rock sampling. Core drilling is initiated only if earlier investigative work indicates considerable potential exists for a commercial ore deposit.

Uranium Occurrences

Uranium mineralization is essentially confined to the Precambrian and Cambrian-Silurian rock sequence of Norway. Mineralization in Precambrian rocks is closely associated with highly folded and metamorphosed rocks; in the Cambrian-Silurian formations, it is likely to occur along unconformable contacts with Precambrian rocks, and in overlying bituminous shales and sandstones. The mineralization probably originated as a result of hydrothermal action on extensively altered basement rock, whereby widely disseminated minerals were gradually taken into solution for later precipitation in a favorable host environment. Uranium is deposited in highly brecciated and fractured zones in Precambrian rocks, and along contact and carbonaceous zones in the shale and sandstone. It may occur in concentration along a vein or fracture surface, or disseminated throughout the favorable zone. The important uranium minerals are pitchblende and uraninite.

There are a number of known occurrences of uranium mineralization in Norway as shown in Figure 1. In most cases, however, the uranium occurs as a minor accessory mineral to one or two other minerals. Historically, the exploration and development process has been for the economic recovery of the "other" minerals. Uranium has not been produced in Norway in recent years.

One of the more interesting areas where uranium is known to occur with other minerals is located in the Komagfjord Window, near the community of Porsa in northern Norway. Precambrian rocks of the Raipas Suite are exposed in the Komagfjord Window. The NGU carried out an airborne gamma-ray survey over the area in 1975. Uranium mineralization was discovered during a ground check in two old mines of the Porsa-Neverfjord copper district. Uranium was found in the Bachkes and Bahrs mines which are situated about two kilometers apart. Uranium has not been found in other copper mines within the district.

The uranium mineralization is restricted to a definite geologic zone in each mine. At the Bachkes mine, pitchblende occurs in association with copper and iron sulfides and a host of gangue minerals. Secondary copper, iron and uranium occur in highly altered rock. The main host rock is massive and well altered basaltic pillow lavas (greenstone) overlain by a dolomite/limestone sequence. All rock types have undergone metamorphism. The minerals formed in a highly fractured rock segment, probably as a result of hydrothermal activity. The uranium content of select samples taken from the mine averaged 0.40% U_3O_8. The highest assay recorded was 1.00% U_3O_8.

Uranium mineralization in the Bahrs mine occurs in the same rock-type. The uranium mineral is brannerite and it contains traces of lead, iron, chromium and nickel. The brannerite occurs as an intergrowth with rutile. The suite of commercial sulfide minerals and the gangue minerals is like that at the Bachkes mine. The uranium content of ore samples averaged only 0.10% U_3O_8.

The source of the uranium is thought to be from the bituminous shales which overlie the metamorphosed rocks. The shales contain an average of 10 ppm uranium. The uranium was taken into solution by descending hydrothermal solutions and deposited among the altered and fractured rock. It was later remobilized to form an integral part of existing ore deposits. The uranium occurs in small amounts and is not of commercial interest; however, the immediate vicinity is favorable for additional uranium and more exploration is needed.

Most of the remaining uranium shows are related to the pegmatites of the Iveland and Evje districts in southern Norway, and the Precambrian granites of the Telemark-Oslo region which contain higher than normal concentrations of uranium. Three separate granite intrusions extending northwest through the Oslo region for a distance of about 300 Km are known to contain from 5 to 10 ppm uranium. The potential for a low grade, large tonnage deposit of uranium exists throughout the region.

The Cambrian bituminous shales also have an abnormally high uranium content of about 110 ppm U_3O_8.

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The shales cover hundreds of square kilometers in the Oslo region, so the potential exists for the discovery of important mineralization within the shale district. Additional evaluation work is required for the shale zones.

The graphitic schists located near Holandsfjord in central Norway contain 40 to 160 ppm U_3O_8. The occurrence has perhaps the highest potential for a uranium mining and recovery project in the country due to favorable geology and mode of occurrence. However, the potential of the mineralization has not been fully evaluated. It seems likely that additional uranium will be discovered in the graphitic environment.

The overall potential for the discovery of commercial uranium presources in Norway is only moderate. Geologically, the Norwegian portion of the Fennoskandian Shield, separated from Sweden by the Caledonian mountains, has considerably fewer ore deposits of economic importance than does the shield area of Sweden and Finland. The potential for important uranium deposits is lessened accordingly.

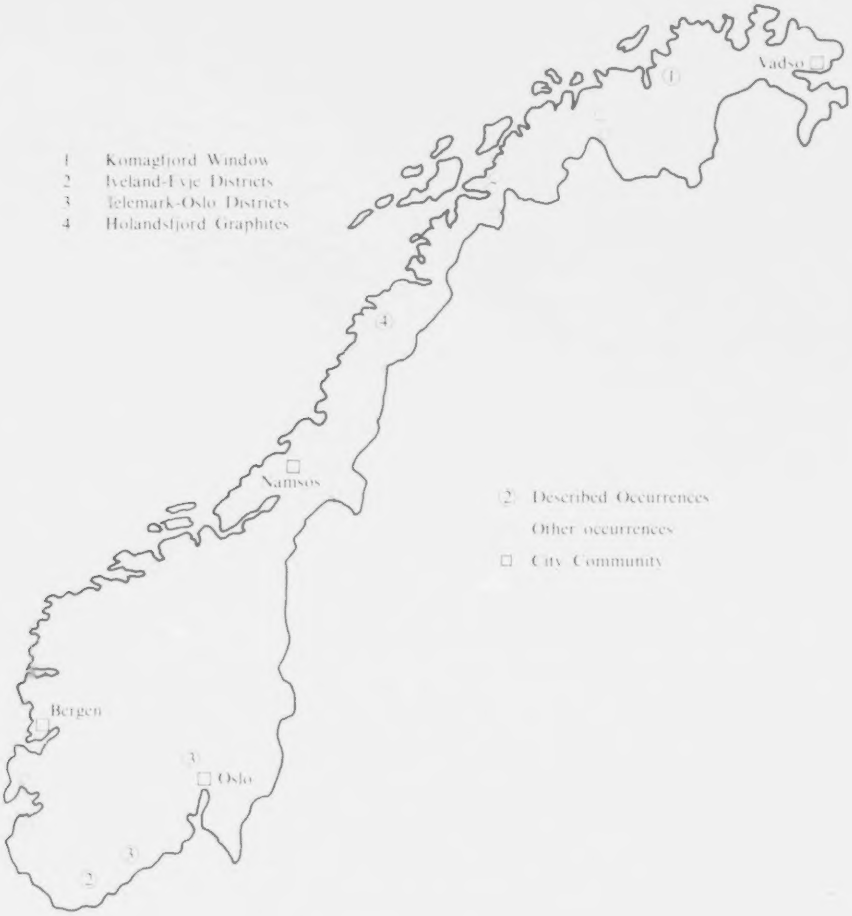
Vadso
(1)
1 Komagfjord Window
2 Iveland-Evje Districts
3 Telemark-Oslo Districts
4 Holandsfjord Graphites
(4)
Namsos
② Described Occurrences
Other occurrences
☐ City Community
Bergen
(3)
Oslo
(3)
(2)

Figure 1

URANIUM OCCURRENCES IN NORWAY
Numbered Occurrences Described in Text

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STATISTICAL DATA

EXCHANGE VALUE $17.00/lb. U_3O_8
Determined as of September 30, 1982

Definition[1]

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

[1] In December, 1981, Nuexco published a history of the Exchange Value which chronicled, month-by-month, changes in its definition, usage and derivation. Copies are available upon request.

TRANSACTION VALUE[2]
Determined as of September 30, 1982

$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
17.30	3.2	16	3

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

[2] Transaction Values for 1976 through 1981 and their associated parameters (millions of pounds, number of transactions and number of months) are tabulated on pages 31 and 32 of Report 161.

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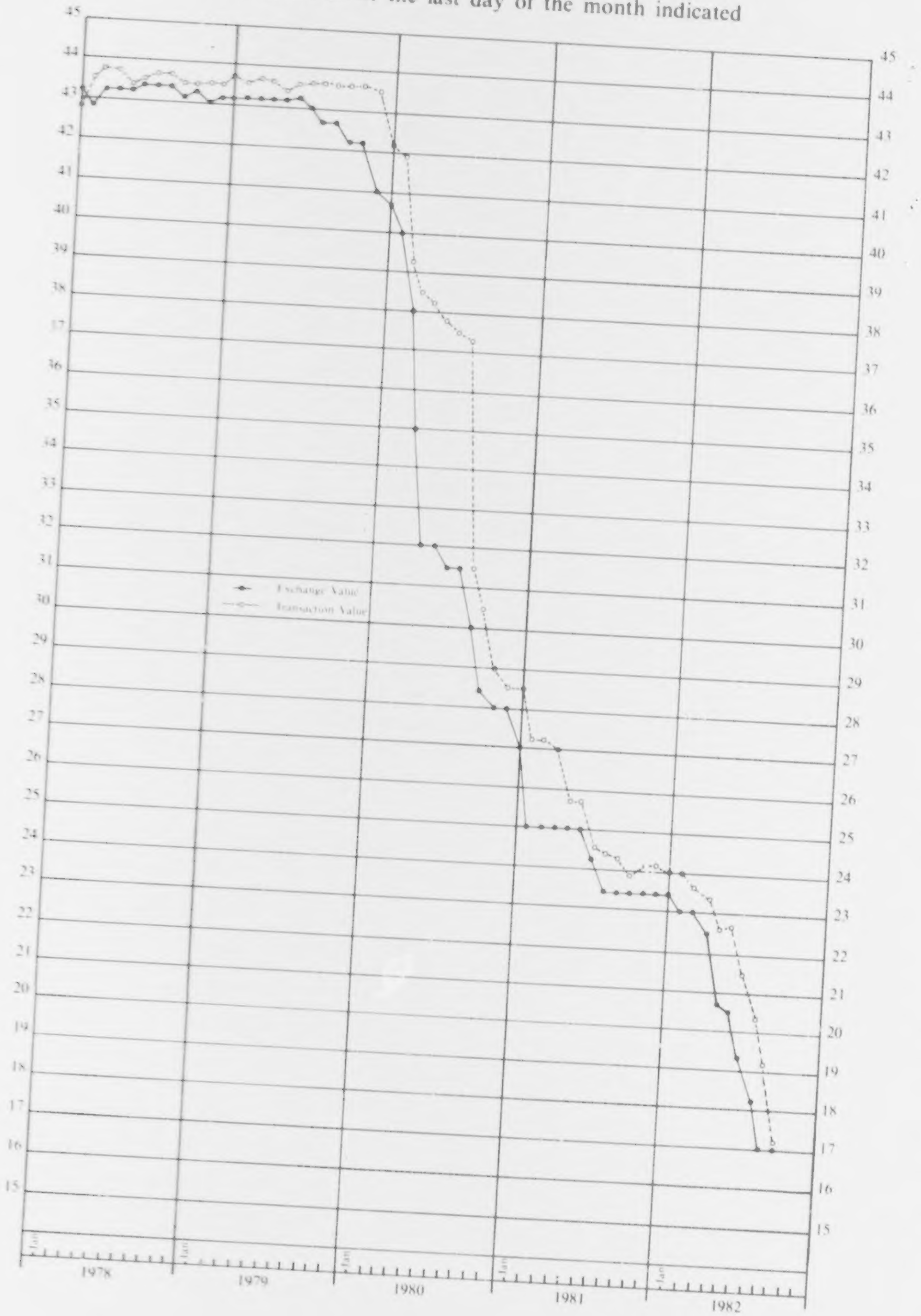
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1978

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00			

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30			

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country	per lb. U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	17.00	37.48	44.20
France (franc)	121.34	267.51	315.46
FRG (mark)	42.89	94.55	111.49
Japan (yen)	4,556	10,045	11,846
Switzerland (franc)	36.84	81.21	95.77
UK (pound)	10.00	22.05	26.01
Australia (dollar)	17.89	39.43	46.50
Canada (dollar)	20.96	46.22	54.50
Niger, Gabon (CFA)	6,071	13,385	15,784
South Africa (rand)	19.60	43.20	50.95
Sweden (kroner)	106.78	235.42	277.61

[1] Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE \$1.10/lb. U as UF_6
Determined as of September 30, 1982

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:
A. Data from recently completed transactions.
B. Data from pending transactions.
C. Firm bids to buy and firm offers to sell.
D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:
A. The price of conversion services delivered or to be delivered under old contracts.
B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE[1] 6%
Determined as of September 30, 1982

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:
A. Data from recently completed or pending loan transactions.
B. Rates included in firm proposals to borrow or lend.
C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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[1] Monthly data for 1968 through 1981 appear on pages 32-34 of Report 162.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1971[3]	101.5	65.95
Annual Avg. 1972[3]	105.6	71.26
Annual Avg. 1973[3]	124.4	78.96
Annual Avg. 1974[3]	141.9	108.07
Annual Avg. 1975[3]	150.4	132.55
Annual Avg. 1976[3]	168.4	160.93
Annual Avg. 1977[3]	192.0	179.03
Annual Avg. 1978[3]	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8	218.00
Annual Avg. 1981	355.3	237.34R
Apr 1981	354.6	229.38
May 1981	353.4	237.31
Jun 1981	360.4	237.93
Jul 1981	356.9	237.86
Aug 1981	359.9	237.86
Sep 1981	357.4	238.00R
Oct 1981	351.6	239.26
Nov 1981	351.3	241.31R
Dec 1981	349.9	258.56R
Jan 1982	354.9	261.58R
Feb 1982	356.7	262.95R
Mar 1982	360.3	263.12R
Apr 1982	368.1	262.99R
May 1982	367.9	263.24R
Jun 1982	367.6P	264.19R
Jul 1982	369.5P	268.20

P = Preliminary   R = Revised since last month

[1] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.

[2] Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.

[3] Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1] [2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3] [4]		
		Metal Mining, including Milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2	10.59	8.05	8.50
Annual Avg. 1981	272.3P	12.02	9.03	9.53
Jul 1981	274.3	11.92	9.20	9.62
Aug 1981	276.2	11.83	9.15	9.63
Sep 1981	276.9	12.47	9.22	9.77
Oct 1981	279.3	12.78	9.35	9.91
Nov 1981	278.8	12.89	9.45	9.89
Dec 1981	280.0	12.87R	9.42	10.03
Jan 1982	281.9	13.14R	9.53	10.11
Feb 1982	283.4	13.25R	9.60	10.19
Mar 1982	284.6	13.34R	9.62	10.35
Apr 1982	287.4	13.46R	9.79	10.48
May 1982	288.8R	13.64P	9.88P	10.62P
Jun 1982	289.8P	13.47P	9.99P	10.68P
Jul 1982	290.5	—	—	—
Aug 1982	290.2	—	—	—

P = Preliminary R = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.

[2] Monthly data for 1973 through 1978 appear on page 4.13 of Nuexco Report 138.

[3] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.

[4] Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)	Total Employment in Mining and Quarrying (Code 35)[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[5]
Annual Avg. 1971[3]	7.88	106.4[4]	59.1	652,294	415,956
Annual Avg. 1972[3]	8.79	113.3[4]	63.9	623,067	443,933
Annual Avg. 1973[3]	10.51	124.1[4]	72.3	684,743	572,133
Annual Avg. 1974[3]	13.18	138.5[4]	85.3	674,140	761,596
Annual Avg. 1975[3]	16.71	157.2[4]	100.0	639,473	1,003,617
Annual Avg. 1976[3]	19.30	174.7[4]	115.1	671,240	1,212,983
Annual Avg. 1977[3] [6]	23.87	194.4[4]	130.0	712,006	1,420,670
Annual Avg. 1978[3] [6]	27.14	137.2	142.7	664,571	1,537,169
Annual Avg. 1979[3] [6]	30.18	155.3	164.5	692,209	1,830,632
Annual Avg. 1980[6]	35.53	176.7	192.1	714,379	2,279,615
Annual Avg. 1981	41.89	203.5	218.3	728,506	2,820,505
Mar 1981	39.26	195.2	209.9	705,010	210,151
Apr 1981	—	196.4	211.6	719,674	217,124
May 1981	—	197.7	213.2	726,869	219,880
Jun 1981	40.41	200.0	215.3	728,506	237,049
Jul 1981	—	204.6	218.4	735,839	249,080
Aug 1981	—	208.0	222.6	722,684	245,817
Sep 1981	43.28	211.6	224.6	724,604	251,502
Oct 1981	—	213.4R	227.0	717,918	248,159
Nov 1981	—	214.8	229.4	720,255	253,044
Dec 1981	44.52	216.3	230.4	709,612	257,655
Jan 1982	—	217.6	233.1	700,375	257,173
Feb 1982	—	220.2	236.8	705,992	250,191
Mar 1982	45.49	225.2	237.4	725,700	262,210
Apr 1982	—	228.9	241.9	707,502	252,562
May 1982	—	230.3	244.8	715,162	258,770
Jun 1982	45.77	232.1	246.7	707,552	261,361
Jul 1982	—	234.1	249.4	—	—
Aug 1982	—	236.8	—	—	—

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[1] Chamber of Mines of South Africa, Johannesburg; "Analysis of Working Results," published quarterly.

[2] Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[3] Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.

[4] April 1970 = 100.00.

[5] Bulletin of Statistics, Department of Statistics, Pretoria.

[6] Historical data for Codes 35 and 40 1977-1980 appear on page 28 of Nuexco Report 157.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index— Industrial Commodities (1967 = 100)[1]	Producer Price Index— All Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
					Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Annual Avg. 1971[5]	114.1	114.0	121.3	96.02	4.12	4.15	3.97	3.49
Annual Avg. 1972[5]	117.9	119.1	125.3	100.00	4.56	4.59	4.26	3.71
Annual Avg. 1973[5]	125.9	134.7	133.1	105.80	4.84	4.98	4.51	3.91
Annual Avg. 1974[5]	153.8	160.1	147.7	116.02	5.44	5.63	4.88	4.21
Annual Avg. 1975[5]	171.5	174.9	161.2	127.15	6.13	6.24	5.39	4.64
Annual Avg. 1976[5]	182.4	183.0	170.5	133.71	6.76	6.87	5.91	4.96
Annual Avg. 1977[5]	195.1	194.2	181.5	141.70	7.28	7.67	6.43	5.39
Annual Avg. 1978[5]	209.4	209.3	195.4	152.05	8.23	8.56	7.02	5.82
Annual Avg. 1979[5]	236.5	235.6	217.4	165.46	9.27	9.50	7.60	6.32
Annual Avg. 1980[5]	274.8	268.8	246.8	177.36	10.27	10.63	8.30	6.95
Annual Avg. 1981	304.1	293.4	272.4	193.71	11.55	11.98	9.12	7.62
Sep 1981	307.4	295.7	279.3	195.61	12.10	12.70	9.38	7.75
Oct 1981	309.0	296.1	279.9	—	12.08	12.44	9.37	7.80
Nov 1981	309.3	295.9	280.7	—	12.12	12.48	9.42	7.83
Dec 1981	310.0	295.8	281.5	200.10	12.08	12.45	9.53	7.90
Jan 1982	311.8	298.3	282.5	—	12.19F	12.66F	9.68	8.02R
Feb 1982	311.6	298.6	283.4	—	12.22F	12.61F	9.68	8.09R
Mar 1982	311.0	298.0F	283.1	203.68	12.29	12.69	9.71	8.01
Apr 1982	309.9	297.9P	284.3	—	12.23	12.68	9.81	8.03
May 1982	309.5P	298.6P	287.1	—	12.25	12.71	9.83	8.05
Jun 1982	310.7P	299.4P	290.6	205.98P	12.26	12.91	9.95	8.09
Jul 1982	313.0P	300.6P	292.2	—	12.24P	12.93P[6]	10.01P	8.18P
Aug 1982	313.4P	300.4P	292.8	—		—	10.01P	8.25P

P = Preliminary R = Revised since last month F = Final

[1] US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2] US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3] US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4] US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[5] Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Nuexco Report 154.
Monthly data 1979-1980 for Employment and Earnings, Revised Establishment Data, all listed codes, appear on page 22 of Nuexco Report 158.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

[6] Primary Non-Ferrous Metals (SIC 333) for July 1982 was incorrectly printed in Nuexco Report 169 as 11.42

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FIGURES OF THE MONTH

	This Month	Last Month	12 Months Ago
	(Referenced to September 30, 1982)		
Exchange Value[1]	17.00	17.00	23.50
Transaction Value[1]	17.30	19.10	23.90
Conversion Value[2]	1.10	0.90	1.10
Loan Use Charge Rate[3]	6%	6%	5½%
Near-Term Uranium Supply[4]	3.3	1.7	7.4
Near-Term Uranium Demand[5]	0.66	0.16	2.4
Near-Term Supply-Demand Ratio	5.0	10.6	3.1
Optimum Tails Assay[6]	.346	.341	.287
Current Transactions[7]:			
Number of Transactions	7	10	5
Quantity of Material[8]	0.8-2.0	2.2-4.4	6.1-10.4

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[1] US $ per pound U_3O_8 equivalent
[2] US $ per pound U as UF_6
[3] Per annum
[4] Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[5] Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U_3O_8)
[6] Percent U_{235}. Theoretical calculation based on Exchange Value, Conversion Value, and the USDOE price for separative work under AEC contracts.
[7] Uranium transactions only; does not include loans or conversion transactions
[8] Millions of pounds U_3O_8, equivalent

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NUEXCO REPORT 170
EXECUTIVE SUMMARY

Exchange Value Unchanged at $17.00	The **Exchange Value** as of September 30, 1982 is $17.00 per pound U_3O_8. The spot/near-term markets were unusually active for the fourth consecutive month.
Near-term Supply and Demand Both Increased Significantly	*Active* sellers in the zero to one year time frame are offering 3.3 million pounds U_3O_8, up from 1.7 million pounds last month. *Active* uranium demand in the zero to one year time frame increased sharply, to 660 thousand pounds U_3O_8.
Near-term Supply-Demand Imbalance Eased	The ratio of near-term supply to near-term demand dropped to 5.0:1 this month.
Transaction Value Declined $1.80 to $17.30	The **Transaction Value** as of August 31, 1982 is $17.30 per pound U_3O_8. It includes 16 transactions totaling 3.2 million pounds U_3O_8 and covers a period of three months.
Seven Uranium Sales	Seven uranium sales are reported this month. The total quantity falls in the range of 0.8 million to 2.0 million pounds U_3O_8.
Conversion Value Rose Twenty Cents to $1.10	The **Conversion Value** as of September 30, 1982 is $1.10 per pound U as UF_6, up twenty cents from last month. Two conversion transactions are reported. Active sellers are offering 1.8 million pounds U as UF_6 in near-term conversion services, while active demand amounts to only one hundred thousand pounds UF_6.
Africa	Combined output from Rand Mines' Blyvooruitzicht and Harmony operations increased slightly in the year ended June 30, 1982 to 1,876,000 pounds U_3O_8.
Australia	Developers of Beverley deposit in South Australia plan to install pilot plant next year to test in situ leach techniques.
Canada	A major topic of discussion in Canada is US embargo legislation and its potential impact on Canadian producers.
Europe	In the **Federal Republic of Germany** (FRG), a stricter power plant emissions standard could increase pressure to build and license new nuclear units.
	The Uranium Institute held its annual symposium in London. Excerpts of some of the most relevant speeches are presented.
United States	1. Sohio—Reserve settlement left Sohio with L-Bar mine, Seboyeta mill, U_3O_8 inventory, some of Reserve's debts.
	2. South Carolina Electric & Gas began loading fuel for its Summer nuclear unit.
Commentary	The prospects for enactment of a US uranium import embargo remain highly uncertain.
Essay	The continuing viability of the US uranium production industry is essential to US utilities' desire for assured future supplies of *domestic* uranium. If market participants can learn enough from the painful lessons of the industry's first two price cycles, it should be possible to avoid over-contracting and, in so doing, reduce the likelihood of still another cycle of boom and bust.
Market Analysis	1. The *Market Analysis* section resolves the apparent conflict between DOE data that indicated US utilities' inventories declined during 1981, and the fact that the US produced much more uranium than it consumed.
	2. The Variable Tails Assay Option does not raise uranium demand as much as it might appear. In fact, secondary swu market transactions will offset at least half of the apparent increase.
Raw Materials	Describes uranium occurrences in Norway.

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